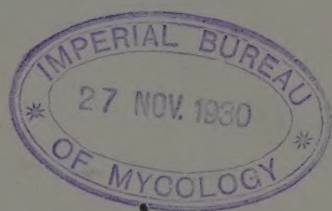


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**SERIES B: MEDICAL
AND VETERINARY.**

**VOL. XVI.
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ERRATA.

- Page 48 line 22 for "HOFFMANN (W.F.)" read "HOFFMANN (W.H.)"
- „ 60 1 line from end for "rockfelleri" read "rockefelleri"
- „ 96 line 39 for "Caliope" read "Calliope"
- „ 104 „ 15 „ "rüPELLI" „ "rüPPelli"
- „ 114 „ 8 „ "rosipennis" „ "roseipennis"
- „ 114 „ 17 „ "Jansco" „ "Jancsó"
- „ 189 and 190 lines 43 and 1 for "PRUNELLE" read
"PRUNNELLE"
- „ 208 and 211 lines 30 and 48 for "BOREL (M.)" read "BOREL (E.)"
- „ 256 line 32 for "buski" read "buschi"

REVIEW

OF

APPLIED ENTOMOLOGY.

SERIES B.

VOL. XVI.]

[1928.

METALNIKOV (S.). **L'infection microbienne et l'immunité chez la mite des abeilles, *Galleria mellonella*.**—*Monog. Inst. Pasteur*, 8vo, 140 pp., 22 figs., numerous refs. Paris, Masson et Cie, 1927. Price *Fr.* 18.

This is a review of the biology and nutrition of, and the occurrence of immunity in, *Galleria mellonella*, L., largely taken from the author's previous papers, a number of which have been noticed in this *Review*. From this the author draws general conclusions as to the factors concerned in immunity in animals, stating a theory that is applicable to all living organisms.

ALESSANDRINI (G.). **Sull'importanza degli insetti nella distruzione dei cadaveri.** [The Importance of Insects in the Destruction of Corpses.]—*Ann. Igiene*, xxxvii, no. 8, pp. 497-514. Rome, August 1927.

The rapid destruction of corpses interred in the walls of mortuary chapels in Italy seems due to a large extent to insects, particularly flies. The species concerned are discussed; as they gain access through cracks in the coffin and walls, it is suggested that the use of hermetically sealed coffins should not be permitted, and that where coffins are placed in niches in the wall, apertures should be provided, screened with a wire gauze permitting the entrance of the larvae, but preventing the exit of the adults.

TAYLOR (I. R.). **Oxygen Consumption of individual Pupae during Metamorphosis.**—*J. Morph.*, xlv, no. 2, pp. 313-339, 16 figs., 9 refs. Philadelphia, Pa., 5th September 1927.

The following is taken from the author's summary. The rates of oxygen consumption of single pupae of the blow-flies, *Phormia terraenovae*, R.-D., *P. regina*, Mg., and *Lucilia sericata*, Mg., the flesh fly, *Sarcophaga tuberosa sarracenioides*, Aldr., and the moths, *Ephestia kühniella*, Zell., and *Galleria mellonella*, L., during metamorphosis, until emergence, have been determined. The record for each

pupa, with the exception of those of the blow-flies, is practically continuous day and night during the period of pupal development, which lasted from 140 to 300 hours, according to the species. During pupal development there is first a period of decrease in rate, which is later followed by a steady increase until a short time before emergence, when a sudden decrease occurs. The "oxygen curves" of the blow-fly pupae are quite different from those of the moth pupae, although all are of the same general U-shaped type. There are strong indications of a specific difference in the curves of the blow-fly pupae. The curves of the two moth pupae differ slightly. During the major part of development the rates of oxygen consumption of pupae of both sexes of the two moths are about the same, but near the end of metamorphosis the females have higher rates than the males. No such sex difference appears among the Dipterous pupae used.

NICOLLE (C.), ANDERSON (C.) & COLAS-BELCOUR (J.). **Sur un nouveau spirochète sanguicole pathogène (*Sp. normandi*) transmis par un Ornithodore (*Orn. normandi*), hôte des terriers de rongeurs nord africains.**—*C.R. Acad. Sci. Fr.*, clxxxv, no. 5, pp. 334-336. Paris, 1927.

The authors found that the rodent in the burrows of which *Ornithodoros normandi*, Larr., is usually found in Tunisia [*R.A.E.*, B, xi, 146] is a gerbille, *Meriones shawi*. In the crushed bodies of six of these ticks they discovered a spirochaete, which they describe as *Spirochaeta normandi* [sp. n.]. This spirochaete produced an infection in white mice, which were the most noticeably receptive animals, when inoculated into them. A series of four or five relapses during which spirochaetes occur in the blood takes place, with intervals in which they are not seen, but during which the blood remains virulent. The infection appears to last more than a month. The white rat is very little receptive to infection, and the guineapig is immune, but *Meriones shawi* is more receptive to this spirochaete than to those of other tick fevers studied by the authors. A monkey, inoculated under the skin, developed a fever with four relapses. Results were negative with a sparrow and two lizards.

Nymphs and a few adults of *Ornithodoros normandi*, collected wild, transmitted infection to *Meriones shawi* by biting, and a naturally infected individual of *M. shawi* was also collected. Attempts to transmit infection from monkey to monkey by means of lice [*Pediculus*] taken from man failed.

The differences, particularly in infectivity and vectors, between *Spirochaeta normandi* and the various spirochaetes causing relapsing fever are discussed. It closely resembles *S. duttoni* and *S. crociduræ*, which are very similar to each other, if not identical, but differs from them by its slight pathogenicity for the rat and its greater pathogenicity for the gerbille. The preliminary results of cross-immunity tests confirm the specific distinctness of *S. normandi*.

It is suggested that search should be made for *Ornithodoros normandi* or related ticks in the burrows of rodents in other countries where spirochaetes similar to *S. normandi* occur, particularly at Dakar [*cf. R.A.E.*, B, xv, 50, 53].

NICOLLE (C.) & ANDERSON (C.). **Transmission du spirochète de la musaraigne par *Ornithodoros moubata* et mécanisme de la transmission des spirochètes récurrents par les tiques. Transmission expérimentale du spirochète de la récurrente espagnole par *Ornithodoros moubata* et mécanisme de cette transmission.**—*C.R. Acad. Sci. Fr.*, clxxxv, no. 6, pp. 373-375; no. 8, pp. 433-434. Paris, 1927.

Experimenting with rats and a guineapig infected with spirochaetes [*Spirochaeta crociduræ*] from a shrew [*Crocidura stampfli*], the authors found that *Ornithodoros moubata*, Murr., the natural vector of relapsing fever [caused by *Spirochaeta duttoni*] in Central Africa is also capable of transmitting *S. crociduræ*. They proved that the nymphs transmit the spirochaete by their bites, whether the infection is inherited from infected adults or acquired in the nymphal stage, but that the ticks, if infected as adults, cannot transmit it by biting, although an emulsion of infected adults is infective. It is not yet known whether adults infected as nymphs can transmit the spirochaete, but it seems probable, as *O. maroccanus*, Velu, infected in the nymphal stage with the spirochaete of Spanish relapsing fever [*S. hispanicum*] is still infective when adult. If infected only when adult, it does not transmit the virus by biting, but the infection is hereditary. These facts support the authors' opinion that the principal rôle in the transmission of relapsing fever by ticks is carried out by the nymphs and that small mammals, especially rodents, are the reservoirs of these infections.

The second paper records similar experiments proving that *O. moubata* (which does not occur in Spain or Morocco) may transmit Spanish relapsing fever and that the mechanism of the transmission is the same as in the case of *S. crociduræ*. The adult ticks retain the spirochaetes ingested by them for a long time, but cannot transmit them by biting. The nymphs from these adults transmit the spirochaetes when they bite, though only at the second feed.

MERCIER (L.). **Présence de *Chrysomyia albiceps* Wied. (mouche du ver épineux de la laine des moutons australiens) sur la Côte du Calvados.**—*C.R. Acad. Sci. Fr.*, clxxxv, no. 16, pp. 795-797, 5 refs. Paris, 1927.

Chrysomyia albiceps, Wied., has a wide distribution in the Mediterranean region, Africa, the East Indies and Australia, and has been recorded from Spain and Egypt. In France this fly is found along the Mediterranean coast, and it is here recorded as far north as Luc-sur-Mer (Côte du Calvados), where a female was captured in September 1926 and two males in September 1927. The insects must either have been introduced, possibly at Le Havre, as larvae or pupae in wool from Australia or Africa, or they are part of a residual, southern fauna. In view of the rarity of the species, there is no danger of its becoming a pest in France.

LEGENDRE (J.). **Races de *Stegomyia fasciata* et fièvre jaune.**—*C.R. Acad. Sci. Fr.*, clxxxv, no. 22, pp. 1224-1226, 3 refs. Paris, 1927.

In many countries where *Aedes argenteus*, Poir. (*Stegomyia fasciata*, F.) exists yellow fever is unknown. For instance, in spite of the relations with the west coast of Africa where formerly the disease was

severe, and where it still reappears epidemically every year, the coast of Mauritania, the south-east and south-west coasts of Africa, Madagascar and the Mascarene Islands have escaped infection. This immunity dates from the time that sailing ships went to India by way of the Cape.

The author considers that there are two forms of the mosquito; the one studied by him in Indo-China, Madagascar, Syria, etc., with a slim, white larva and slender adult, is an Oceano-Indian race and transmits dengue, while the other, with a large, blackish larva and thick-set adult, found in French West Africa, is an African-American race and transmits yellow fever. The author believes that the latter race is also able to transmit dengue [*R.A.E.*, B, xv, 180], but that the smaller race, the vector of dengue, which often appears as an epidemic in countries where *A. argenteus* exists, is incapable of transmitting yellow fever. Since the opening of the Panama Canal no case of yellow fever has been recorded from the Far East.

LEGENDRE (J.). **La dengue ouest-africaine.**—*Pr. méd.*, xxxiv, no. 64, pp. 1012-1014. Paris, 11th August 1926.

An account is given of the epidemic of dengue that occurred in June 1925 in the Upper Volta district, French West Africa. It affected 30 out of a white population of 60, and coincided with a great increase of *Aedes argenteus*, Poir. (*aegypti*, L.) [*R.A.E.*, B, xv, 180].

HERNANDEZ BAUTISTA (D.). **La fiebre amarilla de 1923 en Bucaramanga.** [Yellow Fever in Bucaramanga in 1923.]—*Repert. Med. y Cirugia*, xvii, nos. 5-10 (197-202), pp. 267-288, 334-349, 398-415, 463-475, 510-531, & 582-602, 20 refs. Bogotá, February-July 1926. (Abstract in *Trop. Dis. Bull.*, xxiv, no. 2, pp. 104-105. London, February 1927.)

The second and longest section of this paper deals with yellow fever in general and also describes the bionomics of the vector [*Aedes argenteus*, Poir.].

BUDDLE (R.). **A Rough Guide to the Identification of Mosquitos.**—*J. R. Nav. Med. Serv.*, xiii, no. 3, pp. 217-222, 2 figs. London, July 1927.

The characters distinguishing the adults and larvae of *Anopheles* from those of *Culicines*, and the adults of *Culex* from those of *Aedes* are given, with very brief notes on the breeding-places of these genera and on the collection and treatment of specimens.

SPEER (A. J.). **Compendium of the Parasites of Mosquitoes (Culicidae).**—*Bull. U.S. Hyg. Lab.*, no. 146, 36 pp. Washington, D.C., 1927.

This is a list of the animal and bacterial parasites, including the causal organisms of diseases, recorded from mosquitos throughout the

world, arranged under the species of mosquito. It is preceded by a list of the genera of the parasites, in which the type species of each is given.

For the flagellate recorded in 1907 from *Culex* in Michigan as *Crithidia fasciculata* by Novy, MacNeal and Torrey, the author proposes the name *Herpetomonas* (*Leptomonas*) *michiganensis*, this flagellate being distinct from *C. fasciculata* described from Europe.

KOBAYASHI (H.). **Malaria in Chosen [Korea].**—*Mitt. Med. Akad. Keijo*, ix, no. 3-4, reprint 1 p. 1926. (Abstract in *Trop. Dis. Bull.*, xxiv, no. 4, p. 252. London, April 1927.)

Only *Plasmodium vivax* has been detected in Korea, although other clinical types of malaria, especially quartan, are prevalent. *Anopheles hyrcanus* var. *sinensis*, Wied., is everywhere common, and *A. koreicus*, Yam. & Wat., also occurs.

SEVERN (A. G. M.). **Malaria, and Malaria Prophylaxis in Formosa.**—*Caduceus, J. Hongkong Univ.*, v, no. 3, pp. 219-226. Hongkong, November 1926. (Abstract in *Trop. Dis. Bull.*, xxiv, no. 9, p. 724. London, September 1927.)

Local conditions in Formosa are reviewed, particularly in contrast with those in Hongkong. The three commonest Anophelines in both places are *A. hyrcanus* var. *sinensis* (by far the most widely spread species), *A. minimus* and *A. maculatus*. In Formosa the first is said to be a vector of benign tertian and quartan malaria, and the other two of malignant tertian.

KOIDZUMI (M.). **Eight Years' Observation of the Seasonal Prevalence of *Anopheles sinensis* W. in Formosa, with some Remarks on the Influence of Climatic Conditions, and on the Habits of Mosquitoes.** [*In Japanese.*]—*Taiwan Igakkai Zasshi* (*J. Med. Assoc. Formosa*), no. 256. Taihoku, July 1926. (With a Summary in English, pp. 1-4.)

Daily collections of mosquitos, totalling over 270,000, were made from 1913 to 1922 at the Government Institute of Science at Taihoku. Eleven Anophelines occur in Formosa [*R.A.E.*, B, xv, 138], of which three, *Anopheles hyrcanus* var. *sinensis*, Wied., *A. minimus*, Theo., and *A. tessellatus*, Theo., are found at and around Taihoku. *A. hyrcanus* var. *sinensis* has two main flight periods, the first coinciding with the commencement of the hot weather and having its peak in the first 10 or 20 days in May, and the second at the end of the hot weather, beginning between mid-September and early October. There is a less conspicuous flight period in July. No correlation is recognisable between the regular recurrence of adults and changes in the climatic conditions. For instance, July and August are the hottest months, and while *A. hyrcanus* var. *sinensis* appears in numbers for the second time in July, it remains inactive in August. The third period of activity is followed by a fourth in December or January,

though it may not be marked. It therefore appears that each of the two main flight periods is followed by a less conspicuous one, at an interval of 60–70 days.

SEVERN (A. G. M.). **The Mosquitoes of Hongkong.**—*Caduceus*, J. Hongkong Univ., v, no. 1, pp. 5–9. Hongkong, May 1926.

Previous surveys of the mosquitoes of Hongkong, by Dr. J. C. Thomson in 1900–1901 and by Dr. H. Macfarlane in 1912–1914, are noticed, and the list in the Report of the Hongkong Medical Department for 1922 is reproduced. The author made a survey in 1925, the identifications being due to Mr. F. W. Edwards and, in a few cases, to Liverpool University. The list includes *Anopheles maculatus*, Theo., *A. hyrcanus*, Pall., *A. minimus*, Theo., and *A. maculipalpis*, Giles. The first three are the most abundant. They are relatively commoner in the winter (the dry season), which may be due to the damming of streams that in the rainy season flow too rapidly to permit breeding.

Culex fatigans, Wied., is the commonest mosquito in the colony and occurs throughout the year. *Aedes* (*Stegomyia*) *albopictus*, Skuse (*scutellaris*, Theo. nec Wlk.) comes next in order of abundance. *A. (S.) argenteus*, Poir. (*fasciata*, F.) was found only once.

At least two or three indigenous species of small larvicidal fish occur in ponds and streams, but are less common than formerly. *Macropodus opercularis* (Chinese Paradise fish) feeds voraciously on mosquito larvae and even pupae. The larvae of *Megarhinus regius*, Tennent (*splendens*, Wied.) and of *Lutzia vorax*, Edw., prey on other mosquito larvae.

TIEDEMAN (W. v. D.). **Malaria in the Philippines.**—*J. Prev. Med.*, i, no. 3, pp. 205–254, 23 figs. Baltimore, Md., January 1927.

Malaria accounts for 14·3 per cent. of the deaths in the Philippines. The Anophelines present are *Anopheles barbirostris*, Wulp, *A. fuliginosus*, Giles, *A. hyrcanus* var. *sinensis*, Wied., *A. kochi*, Dön., *A. ludlowi*, Theo., *A. maculatus*, Theo., *A. minimus*, Theo., *A. philippinensis*, Ludl., *A. subpictus*, Grassi, *A. subpictus* var. *malayensis*, Hacker, and *A. tessellatus*, Theo. The synonymy of these species, according to Christophers [*R.A.E.*, B, xiii, 109], is quoted. Their abundance roughly follows the rainfall, except in the case of the stream-breeders, which reach their maximum after the streams have returned to normal for a considerable period, until, towards the end of the dry season, large numbers of the young of certain fish seem to control their numbers temporarily. Tree-breeding species were not found. *A. hyrcanus* var. *sinensis* may occur in rice-fields.

Breeding of most of the species is widespread and continuous, with a few exceptions, notably *A. minimus* and *A. ludlowi*, which occur only in stretches of running streams usually near wooded or undeveloped country. These two have a marked seasonal prevalence, it being very difficult to find either larvae or adults during the height of the rainy season. The incidence of malaria has a marked tendency to follow the seasonal abundance of these two species, which appear to be the main vectors. Conditions are very favourable for the spread of malaria, and mosquito control is the only practical remedy. The only fish that seemed promising was *Dermogenys viviparus*, but it

never occurred in large enough numbers to control mosquitos effectively, probably owing to the action of natural enemies. *Gambusia affinis* was introduced, but is apparently killed off by native fish.

Surveys led to the conclusion that practical mosquito control must involve the use of some cheap larvicide such as Paris green, utilising such agricultural drainage as is practical, and that this can be accomplished at a low cost.

BOSE (K.). **Malaria Control at Birnagar, 1926.**—*Calcutta Med. J.*, xxi, no. 7, pp. 350–384, 3 pls., 2 maps, 1 chart. Calcutta, January 1927.

To the Anophelines recorded in a previous report [*R.A.E.*, B, xiv, 221] must be added *Anopheles vagus*, Dön., which is not a malaria carrier. The sudden appearance of large swarms of mosquitos during the hot and rainy seasons of 1925 was attributed to winter breeding [*loc. cit.*]. In 1926, when there was torrential rain from the end of July to the end of August, no such swarms occurred, and it is suggested that rain and storms check the mosquitos.

The intensity of infection in a malaria epidemic depends on the activity of the adult Anophelines, and this is determined by the break in hibernation, which at Birnagar usually lasts from the end of November to the advent of the monsoon in June. Any shower, or even an increase of moisture, breaks the hibernation, temporarily at least. On cloudy days mosquitos come out in groups from the tree-holes. So far only adult Culicines have been found hibernating in these, the hibernation quarters of the Anophelines at Birnagar not having been discovered. Anophelines, however, must certainly react to weather in a similar manner, and after a shower precautions must be taken against infection.

KLIGLER (I. J.). **The Control of Malaria in Palestine by Anti-Anopheline Measures.**—*J. Prev. Med.*, i, no. 2, pp. 149–183, 15 refs. Baltimore, Md., November 1926.

The information here given has already been noticed from other papers [*R.A.E.*, B, xiv, 56, 57, 127].

JOANNIDÈS (G. S.). **Quelques notes épidémiologiques sur le département de Messénie.** (Faune malacologique et vulnérante, paludisme, f. typhoïde, leishmanioses, lèpre.)—*Grèce méd.*, xxviii, no. 9–10, pp. 33–36, 13 refs. Athens, September–October 1926.

Malaria is very prevalent in this part of Greece. *Anopheles superpictus*, Grassi, is common and *A. maculipennis*, Mg., occurs in small numbers. *Culex pipiens*, L., *Theobaldia longiareolata*, Macq., and *Aedes argenteus*, Poir., abound, while *Culex apicalis*, Adams (*pyrenaicus*, Bröl.) and *C. laticinctus*, Edw., are rare. Sandflies, *Phlebotomus papatasi*, Scop., abound even in the large towns; *P. sergenti*, Parrot, is rare. Kala-azar occurs in children in various places, generally between March and July. A search for the parasite of kala-azar in many insects and other Arthropods gave negative results.

[DODONOVA (O. N.).] **Додонова (О. Н.). Three Years of Malaria Control in the Shatursk Peat Bogs.** [In Russian.]—*Russ. J. Trop. Med.*, v, no. 4, pp. 204-210, 1 fig. Moscow, 1927. (With a Summary in French.)

In the district under discussion only about 2 per cent. of the water surface is treated with oil, so that malaria control is almost entirely limited to quinine prophylaxis. The only Anopheline yet found is *Anopheles maculipennis*, Mg., and it has not yet been discovered where it hibernates under natural conditions. It was not found amongst the stacked peat or the reeds. Other mosquitos present were *Culex pipiens*, L., *Aedes cinereus*, Mg., *A. cataphylla*, Dyar, *A. excrucians*, Wlk., *A. lutescens*, F., and *A. maculatus*, Mg.

[NIKOL'SKIĬ (V. V.) & NABOKOV (V. A.).] **Никольский (В. В.) и Набоков (В. А.). Instructions for the Application of various Poisons for the Control of Mosquito Larvae.** [In Russian.]—*Russ. J. Trop. Med.*, v, no. 4, pp. 210-217. Moscow, 1927.

Methods of applying oil or poisons such as Paris green, etc., against mosquito larvae, and the necessary preliminary work and precautions are discussed.

DE BUEN (S.) & DE BUEN (E.). **Primeros ensayos sobre el empleo del "verde Paris" en España, en la lucha antipalúdica.** [The First Experiments in Spain with Paris Green in Anti-Malarial Work.]—*Bol. téc. Dir. gen. Sanidad*, ii, pp. 161-168, 1927. (Abstract in *Bull. Hyg.*, ii, no. 7, pp. 582-583. London, July 1927.)

The cost of petroleum for use on a large scale against mosquito larvae in Spain would be prohibitive, and Paris green is found to be the next best material. When diluted with wood-ash at the rate of 1:100, it was toxic to the larvae of *Anopheles*, but not to the pupae or larvae of *Culex*.

WETMORE (W. O.). **A Device for Economically Oiling Ponds and other Waterways.**—*J. Amer. Med. Ass.*, lxxxvii, p. 1298, 2 figs., 1926. (Abstract in *Bull. Hyg.*, ii, no. 7, pp. 585-586, 2 figs. London, July 1927.)

This device consists of a conical can divided into a lower chamber to contain some heavy material, such as sand, and an upper chamber to contain oil. Both chambers have caps for filling. A tube is soldered to the outside and runs the length of the oil chamber with an inlet at the top and opening into the oil chamber at the bottom. The apex of the oil chamber has a wire wick to permit the oil to escape in droplets. The can is thrown into the pond and sinks, air escaping from the apex, followed by oil. Water is drawn through the tube into the lowest portion of the oil chamber, displacing the oil. The device works well in water covered with vegetation.

MESSEA (A.) & BRUNELLI (G.). **Istruzioni per l'impiego della *Gambusia* nella lotta antimalarica.** [On the Use of *Gambusia* as an Antimalarial Measure.]—9 pp., 2 figs. Rome: Min. Interno. Direz. gen. Sanità pub., 3rd July 1926. (Abstract in *Bull. Hyg.*, ii, no. 7, pp. 588-589. London, July 1927.)

An account is given of the top-minnow, *Gambusia*, and its use against mosquito larvae.

VITTORIO (V.). **Considerazioni su alcuni ausiliari alla lotta antimalarica.** [Auxiliary Measures in the Campaign against Malaria.]—*Ann. Med. nav. colon.*, ii, pp. 273-292, 25 refs., 1926. (Abstract in *Bull. Hyg.*, ii, no. 7, p. 589. London, July 1927.)

The possibility of using bats, swallows and fish against mosquitos, particularly in Italy, is discussed. It is not considered that bats or swallows are likely to be of much value. The fish dealt with are *Gambusia affinis*, *Carassius auratus* and *Cyprinus carpio*. The first is of the greatest value against mosquito larvae, but it is found necessary in Italy to keep the tanks at a fairly fixed temperature, as it is killed by cold, and it needs protection from larger fish, such as pike.

Carassius auratus feeds chiefly on vegetable matter, and will not attack the larvae if other food is present. If the water can be kept free from vegetation, the fish may prove of some use.

Cyprinus carpio prefers to live in deep water, and the larvae on the surface are only attacked in the absence of other food.

GRASSI (B.). **Bonifiche, laghi artificiali e malaria (a proposito del lago di Lentini).** [Drainage, Artificial Lakes and Malaria.]—46 pp., 1 map, 7 figs. Rome, 1925. (Abstract in *Bull. Hyg.*, ii, no. 7, p. 592. London, July 1927.)

The effect of draining or filling up of lakes on the prevalence of malaria is discussed in general and illustrated by the author's investigations in the case of the Lake of Lentini. This lake, which was made 700 years ago for the purpose of dealing with floods, is for many months of the year largely covered with plants, especially *Myriophyllum spicatum*, which is very favourable to the breeding of Anophelines. Various projects for dealing with it are discussed.

Symposium on Malaria. *Sth. Med. J.*, xx, no. 6, pp. 460-492. Birmingham, Ala., June 1927.

The papers read at the Conference on Malaria held at Atlanta, Georgia, 15th-18th November 1926, included a number on malaria control in several States, as well as the following: H. S. Cumming, The Place of Malaria as a Health Problem; M. F. Boyd, Provisional Outline for Fundamental Data collected in a Malaria Survey; W. A. Hardenbergh, Use of Waste Oil as a Larvacide; F. L. Hoffman, Malaria Problem in Mexico; M. A. Barber, W. H. W. Komp and T. B. Hayne, Some Methods of Estimating the Amount of Malaria in Regions of

Low Endemicity ; T. B. Hayne, A House to House Survey of Malaria in the Mississippi Delta, 1926 ; W. G. Smillie, Further Studies of the Impounded Area at Gantt, Alabama ; and J. A. LePrince, Engineering in Malaria Control. In Hardenbergh's paper the use of waste motor oil, the collection of which incidentally advertises anti-mosquito work, is advocated against mosquito breeding-places. An extremely satisfactory result was obtained by mixing 1 pint of Kresol Dip No. 1 with $4\frac{1}{2}$ gallons of the waste motor oil. This mixture spreads very rapidly and kills all larvae in 10-25 minutes. The conclusions reached in Smillie's paper on the impounded area at Gantt, Alabama, confirm the fact that *Anopheles quadrimaculatus*, Say, is a pond breeder with a limited flight range of about one mile, and that it is the vector of malaria in that area, the disease disappearing when the breeding of this mosquito is checked [*R.A.E.*, B, xv, 25]. In LePrince's paper attention is drawn to the fact that where there is sufficient tree shade there is no vegetation in the water of ditches and the water flow line is free from obstructions and resting places for Anopheline larvae ; the subject of shading in connection with the prevention of mosquito breeding in borrow-pits, etc., is now being studied.

STUART (E.) & STOVER (N. M.). **Eradication of Salt Marsh Mosquitoes.**—*Amer. J. Publ. Hlth.*, xvii, no. 7, pp. 704-707. New York, July 1927.

The information contained in this paper has already been noticed [*R.A.E.*, B, xv, 25].

PRADO (A.). **Especie de Anophelineo raramente encontrado no estado de S. Paulo.** [An Anopheline rare in the State of S. Paulo.]—*Ann. paulist. Med. Cirurg.*, xiv, no. 8, pp. 90-93, 2 figs., 3 refs. S. Paulo, August 1926.

The occurrence in the state of S. Paulo of *Anopheles eiseni*, Coq. (*tibiamaculatus*, Neiva) is recorded, and the species is briefly redescribed.

DAVIS (N. C.), LOBO (M. M.) & CABARROU (F. G.). **Lucha antipalúdica en Medinas. Relación preliminar después de un año de trabajo.** [Anti-Malarial Campaign at Medinas. Preliminary Report after the First Year's Work.]—*Sem. méd.*, xxxiv, no. 1728, pp. 467-485, 27 figs. Buenos Aires, 24th February 1927.

Some of the work described in this paper has been noticed from another source [*R.A.E.*, B, xv, 189]. Of a number of fish occurring in the region that fed on mosquito larvae the most effective appears to be *Fitzroya lineata*. Good results were obtained with copper sulphate for destroying the algae on which the mosquito larvae feed. Work with larvicides was at first directed against larvae of all species, but after 1st July it was limited to those of *Anopheles pseudopunctipennis*, Theo., believed to be the sole vector of malaria. The work was supplemented by drainage, and the results of the campaign were very satisfactory.

FAGGIOLI (R.). *Eristalis tenax*, **parasito accidental del cuerpo humano**. [*E. tenax*, an accidental Parasite of Man.].—*Sem. méd.*, xxxiv, no. 1734, p. 887. Buenos Aires, 7th April 1927.

In this case a child of fifteen months suffered from intestinal disturbance due to the presence of the larvae of the Syrphid, *Eristalis tenax*, L.

COURTIS (B.). **Miasis de saco lagrimal**. [Myiasis of the Lachrymal Sac.].—*Sem. méd.*, xxxiv, no. 1741, pp. 1307–1309, 2 figs., 35 refs. Buenos Aires, 26th May 1927.

A case is recorded of myiasis of the lachrymal sac in man due to the larvae of *Calliphora vomitoria*, L.

FRANCHINI (G.). **Un nuovo caso di myiasi intestinale**. [A further Case of Intestinal Myiasis.].—*Riforma med.*, xliii, no. 5, p. 102, 1 fig. Naples, 31st January 1927.

This case of intestinal myiasis in Italy due to larvae of *Muscina stabulans*, Fall., is remarkable owing to the fact that the patient had complained for two years of diarrhoea and pruritus ani.

AUSTMANN (K. J.). **Creeping Eruption. Report of first Case from Manitoba**.—*J. Amer. Med. Ass.*, lxxxvii, no. 15, pp. 1196–1200, 1 fig., 47 refs. Chicago, Ill., 9th October 1926.

A summary of the subject of "creeping eruption" of the skin is given, its causes, lesions, geographical distribution according to cause, and treatment being dealt with. The case described here is claimed to be the first typical case of creeping eruption with the isolation of the causative organism and its identification as the first stage larva of *Oestrus (Gastrophilus) intestinalis*, DeG.

MEKIE (E. C.). **Parasitic Infection of the Urinary Tract. Report of a Case of Infection of the Urinary Tract by Acari, together with an Analysis of previously reported Cases**.—*Edinb. Med. J.*, xxxiii, no. 12, pp. 708–719, 1 fig., 8 refs. Edinburgh, December 1926.

The author's conclusions are that the urinary tract is liable to become infested by certain mites, and that their presence in the urine indicates true endoparasitism in those cases in which they have been found repeatedly and when careful precautions have been taken against contamination. In this case the mites found in the urine were *Tarsonemus floricolus*, C. & F., *Glyciphagus domesticus*, DeG., and *Tyroglyphus longior*, Gerv.; eggs of the last-named were also present.

WOLCOTT (G. N.). **Entomologie d'Haiti**.—8vo, 440 pp., 133 figs., 7 refs. Port-au-Prince, Haiti, Dept. Agric., 1927.

In this text-book, written primarily for the students of the Agricultural College of Haiti, and explaining the morphology, ecology, classification and economic importance of insects in the Island, certain chapters deal briefly with insects as household pests and those that are noxious to man, with insects, ticks and mites as external parasites of poultry, and insects and ticks that attack domestic animals.

SPANN (—). **Der Kampf gegen die Dasselplage mittels Kochsalz.** [The Treatment of Warbles with common Salt.]—*Süddeuts. landw. Tierzucht*, 1927, no. 38, p. 482. (Abstract in *Deuts. tierärztl. Wschr.*, xxxv, no. 41, p. 666. Hanover, 8th October 1927.)

The application of common salt against larvae of *Hypoderma* in cattle has been found effective. The hair over the orifice of the swelling was clipped, and then the salt was rubbed in thoroughly. Of 150 warbles, 76 per cent. disappeared. It is suggested that applications be made every three days for a fortnight. The injection of a sterile 36 per cent. salt solution caused the rapid disappearance of warbles, but this method is a troublesome one.

SHANNON (R. C.) & DEL PONTE (E.). **Sinopsis parcial de los Muscoideos Argentinos.** [A Classification of some Argentine Muscoidea.]—*Rev. Inst. bact.*, iv, no. 5, pp. 549–590, 4 pls., 5 refs. Buenos Aires, July 1926. (With Summaries in Spanish, French, English and German.) [Recd. October 1927.]

This classification of the Argentine material in the Instituto Bacteriológico, Buenos Aires, covers the CALLIPHORIDAE, OESTRIDAE and MUSCIDAE (including Anthomyiids and Tachinids). Some new species are described. The classification aims at being a basis for further study.

TAKASHIMA (K.). **Carbon Tetrachloride as is applied for the Extermination of Mosquitos and Flies.**—*J. Publ. Hlth. Japan*, iii, no. 6, pp. 1–9. Tokyo, June 1927.

The best method of using carbon tetrachloride against mosquitos and flies is to add cresol-soap solution, but this decreases the value of night-soil as manure owing to its effects on certain plants. A suitable solution is made from the following formula: Caustic potash 27 parts, alcohol (90 per cent.) 48, water 5, linseed oil 120, crude cresol 200. A mixture of 61·5 cc. carbon tetrachloride and 38·5 cc. of this solution, when diluted with a large amount of water, yields a thick, white milky liquid that does not prevent putrefaction of night-soil and is not harmful to plants.

PATERSON (G. C.) & SHANNON (R. C.). **Sobre una nueva especie del género *Phlebotomus* encontrada en las provincias del norte de la República.** [A new Species of *Phlebotomus* from the Northern Provinces of Argentina.]—*Bol. Inst. Clin. quir.*, ii, no. 14–16, pp. 298–304, 3 figs. Buenos Aires, 1927.

Phlebotomus araozi, sp. n., is described from the province of Jujuy, northern Argentina.

PATERSON (G. C.). **Sobre otra nueva especie del género *Phlebotomus* encontrada en la provincia de Jujuy.** [Another new Species of *Phlebotomus* from the Province of Jujuy.]—*Bol. Inst. Clin. quir.*, ii, no. 14–16, pp. 305–309, 3 figs. Buenos Aires, 1927.

Phlebotomus mazzai, sp. n., is described from the Province of Jujuy, northern Argentina.

PATERSON (G. C.), SHANNON (R. C.) & DEL PONTE (E.). **Observaciones sobre la distribución de los flebótomos de las provincias del noroeste de la República Argentina.** [Observations on the Distribution of *Phlebotomus* in the Provinces of North-West Argentina.]—*Bol. Inst. Clín. quir.*, no. 21-25, reprint 6 pp. Buenos Aires, 1927.

Cutaneous American leishmaniasis is common in the Argentine provinces of Salta and Jujuy, especially among workers in forests. *Phlebotomus araozi*, Paterson & Shannon, and *P. mazzai*, Paterson, occur there, and a third sandfly has been reported but not identified. *P. araozi* is found in Salta, Jujuy and Tucumán. It attacks man, horses, poultry, dogs and probably other warm-blooded animals, but has not been noticed sucking the blood of reptiles. It chooses smooth skin or spots where the hairs have been worn off. It occurs in all types of country and is nocturnal, resting by day in dark shelters. It is abundant from mid-October to the end of May. No breeding-places have been found, but captive females oviposit on the droppings of fowls. Under various laboratory conditions the eggs failed to develop in a month. *P. mazzai* is less common, though not rare. Its distribution and habits are similar to those of *P. araozi*. In the few dissections made no herpetomonads were found. Further study is needed in view of the alleged relation between sandflies and leishmaniasis.

MAZZA (S.). **Consideraciones sobre flebótomos encontrados en Tabacal y el papel de estos dípteros en la transmisión de las leishmaniasis.** [Sandflies met with in Tabacal and their Rôle in the Transmission of Leishmaniasis.]—*Bol. Inst. Clín. quir.*, ii, no. 14-16, pp. 310-317, 8 figs., 5 refs. Buenos Aires, 1927.

The present state of knowledge of the relationship of *Phlebotomus* to cutaneous leishmaniasis is briefly reviewed, and a description is given of a male sandfly taken at Tabacal, North Argentina, though the species is not named.

BRÈTHES (J.). **Contribución para el conocimiento de los mosquitos argentinos. Descripción de un nuevo *Megarhinus*: *Megarhinus tucumanus*.** [A Contribution to the Knowledge of Argentine Mosquitos. Description of a new *Megarhinus*: *M. tucumanus*.]—*Bol. Inst. Clín. quir.*, ii, no. 14-16, pp. 318-321, 2 figs. Buenos Aires, 1927.

Both sexes of *Megarhinus tucumanus*, sp. n., are described from the province of Tucumán, North Argentina.

ALESSANDRINI (G.). **I pidocchi nella profilassi del tifo esantematico.** [Lice in Connection with the Prophylaxis of Typhus.]—*Bol. Inst. Clín. quir.*, ii, no. 14-16, pp. 511-517, 2 figs. Buenos Aires, 1927.

The contents of this paper differ from those of one published under the same title several years ago [*R.A.E.*, B, viii, 44]. It is here suggested that the reason why the various substances employed against lice [*Pediculus*] have proved more or less unsatisfactory is due to the existence of a defensive mechanism put into action when the effect of the insecticide becomes noticed. To be effective the material used must be so rapid in its action as to paralyse the defensive mechanism,

and be able to dissolve the wax and fatty material protecting the stigmata. The structure of the stigmata is discussed, and it is concluded that the only real remedies are those capable of paralysing the stigmatic muscles and of penetrating within the stigmata.

As regards the hatching of the eggs, the author considers that the egg is broken and hatching effected by a variation in the proportions of water in the various parts of the egg. By regulating the atmospheric moisture the eggs can be caused to remain closed or to open prematurely. The larva is incapable of emerging by its own efforts.

PINTO (C.) & DREYFUS (A.). *Tunga travassosi* n. sp. parasita de *Tatusia novemcinctus* do Brasil.—*Bol. biol.*, no. 9, p. 174, 4 pls. S. Paulo, 15th September 1927.

A flea, *Tunga travassosi*, sp. n., is described from the armadillo, *Tatusia novemcincta*, in Brazil.

[IOFF (I.) & EFREMOVA (N.).] Иофф (И.) и Ефремова (Н.). The Biology and Fauna of Fleas on Domestic Animals in Central Asia. [In Russian.].—*Pensée méd. Usbékistane*, 1927, no. 3-4, pp. 167-174. Tashkent, February-March 1927. (With a Summary in German, pp. 234-235.)

A study was made of 2,496 fleas taken from dogs and cats over more than a year at Petro-Alexandrovsk. The species concerned were *Ctenocephalus canis* (39 per cent.), *C. felis* (22 per cent.) *Pulex irritans* (8 per cent.), and *Echidnophaga gallinacea* (31 per cent.). The last is common on various wild animals, usually on hedgehogs, and also in the nests of the jerboa, *Rhombomys opimus*.

There seems to be a definite annual cycle. Fleas swarm suddenly in May and June, decrease in summer (owing to lack of moisture), increase again for a short time in September and then decrease again in winter. *E. gallinacea* disappears almost completely from domestic animals in order to hibernate in one or other developmental stage, appearing in numbers in May. The other species hibernate in smaller numbers and their increase on domestic animals in spring occurs earlier, in February or March.

[OLENEV (N. O.).] Оленев (Н. О.). Contribution to the Biology of the Cattle Tick, *Ixodes ricinus*, L., in the Novgorod Government. [In Russian.].—*Défense des Plantes*, iv, no. 2, pp. 354-368, 6 figs. Leningrad, July 1927.

This is a detailed account of the life-history of *Ixodes ricinus*, L., as studied under natural and laboratory conditions in Novgorod. The technique employed is described, and factors such as humidity and temperature that influence the development of this tick are discussed.

SHARP (N. A. D.). Development of *Microfilaria perstans* in *Culicoides grahami*; a preliminary Note.—*Trans. R. Soc. Trop. Med. Hyg.*, xxi, no. 1, p. 70. London, 11th July 1927.

The complete metamorphosis of *Filaria (Acanthocheilonema) perstans* in *Culicoides grahami*, Aust., including the emergence of the larva

from the neck of the midge, has been traced in Nigeria. The time occupied for complete development in the fly is probably six days. About 3 per cent. of the wild midges were naturally infected.

JACK (R. W.). **Report of the Chief Entomologist for the Year 1926. Veterinary and Medical Entomology.**—*Rep. Secy. Dept. Agric. S. Rhodesia 1926*, pp. 24–26. Salisbury, 1927.

Reports as to the efficacy of the fences erected in 1925 in the Lomagundi district to check the southward spread of the tsetse-fly [*Glossina morsitans*] by the creation of a gameless zone [*R.A.E.*, B, xiv, 97] have been favourable on the whole, though much more game has had to be destroyed than was anticipated, and immigration of game from the west across the Angwa river is suspected. The eastern half of the area, however, which is the more infested with tsetse-fly and adjoins the greatest number of affected farms, has been reported almost clear of big game for several months. The value of brush barriers along the fences in keeping out game is unquestionable, but they have been found to be difficult to protect from fire and expensive both in construction and maintenance. In the course of systematic inspection with bait oxen only isolated flies were captured in the suspected country outside the definite fly area, including the fenced zone. Trypanosomiasis was prevalent in the wet season on several farms outside the definite fly area.

In the Hartley district intensive inspection indicated definite eastward advance of the fly, while the density has continued to increase westward from the eastern limit, and heavy losses have been sustained among cattle from trypanosomiasis. Preparations are being made for the erection of 35 miles of fence in this district. An organised late grass fire was not altogether successful owing to inexperience on the part of the operators and lack of wind. Tsetse-flies were taken immediately in the wake of the fire, and the burning had generally no appreciable effect. This experiment illustrates the practical difficulties of grass burning, but cannot be regarded as disproving the effectiveness of this measure. In the Darwin district, where operations against game were carried out in 1923 and 1924 and then discontinued, losses from trypanosomiasis, which were formerly very heavy, are stated to have ceased entirely. Both game and fly are reported to be increasing in the area of the former game elimination experiment [*R.A.E.*, B, xi, 140], and a recrudescence of trypanosomiasis may shortly occur along the adjacent Gwaai river, where the disease has been absent for five years. Reports from the Sebungwe district indicate continuation of the spread of the fly, which has apparently not ceased since 1897.

In one of three experiments carried out in areas uninfested by *Glossina*, in each of which two cattle infected with trypanosomiasis were herded with four healthy animals, one of the associated animals contracted the disease. Notes made during these experiments on the prevalence of blood-sucking flies showed *Stomoxys* to be the most numerous, though it was not very abundant; *Culicoides* was much less in evidence than in the preceding season and only a few Tabanids were recorded; the experiments were not started until after the usual heavy outbreak of *Haematopota* in January and early February was over.

LAVIER (G.). **Particularités du noyau chez les Trypanosomes du groupe *brucei*, d'isolement récent.**—*C.R. Acad. Sci. Fr.*, clxxxv, no. 23, pp. 1325–1327, 4 figs. Paris, 1927.

Studying fresh preparations of strains of trypanosomes of the *Trypanosoma brucei* group in Uganda the author found that, while the position of the nucleus is generally central, it may be either anterior or posterior, and he considers this displacement to be merely a result of division of the trypanosome. Forms with the nucleus posterior occurred in strains of *T. gambiense* as well as in strains of *T. rhodesiense* and *T. brucei*, although less frequently. It was observed during periods of very active division in *T. rhodesiense* and *T. brucei* that sometimes the nucleus does not divide, the whole of it passing to one of the two new individuals. The occurrence of forms without a nucleus has been observed previously but has been explained as being due to degeneration.

STRONG (R. P.). **Investigations upon Flagellate Infections.**—*Amer. J. Trop. Med.*, iv, no. 4, pp. 345–372, 6 pls., 34 refs. Baltimore, Md., July 1924.

While examining the latex of various tropical plants in Central America for parasites, the author discovered a flagellate in three species of *Euphorbia*, *E. pilulifera*, *E. hypericifolia* and *E. callitrichoides*. Examination of the alimentary tract of the Coreid, *Chariesterus cuspidatus*, Dist., which was frequently found feeding on the flowers of these plants, showed that it was often infected with the same flagellate, which was present in the mesenteron, the posterior intestine, the rectum and sometimes in the proboscis and salivary glands. Dissections of the small lizard, *Cnemidophorus lemniscatus*, frequently found inhabiting the dry soil in the neighbourhood of infected *Euphorbia*, revealed the presence of numerous parasites morphologically identical with those found in the plants and insects. Pieces of crushed insects were found in the stomach of one of the infected lizards, and it therefore seems probable that the usual method of infection of the lizard is through feeding on infected Coreids, though it is possible that infection might occur through the ingestion of drops of latex or small particles of the flowers of the plant at the time the lizard swallows the insect, which has itself been feeding on *Euphorbia*.

In order to determine whether this flagellate, which the author considers to be a species of *Herpetomonas*, was transmissible to mammals, white mice, guineapigs, dogs and monkeys were inoculated with flagellates from *Euphorbia* and *C. cuspidatus* with negative results. However, in the case of a monkey inoculated subcutaneously with a portion of the contents of the posterior intestine of the lizard, containing numerous flagellates, a positive result was obtained, definite leishmaniform parasites being found in smears from the granulomatous portions of the ulcer that had formed at the site of inoculation. It is questionable whether the medium in which the flagellates were inoculated may not have had something to do with the primary production of the lesion in the animal (since it contained faecal matter and bacteria in saline solution), by bringing about at least a temporary lowering of resistance or even a destruction of the tissues that enabled some of the leishmaniform parasites to survive and reproduce themselves for a time within such tissues.

Comparative Studies of Herpetomonads and Leishmanias. I. NOGUCHI (H.) & TILDEN (E. B.). **Cultivation of Herpetomonads from Insects and Plants.**—*J. Exp. Med.*, xlv, no. 3, pp. 307-325, 6 pls., 30 refs. Baltimore, Md., 1st September 1926.

II. NOGUCHI (H.). **Differentiation of the Organisms by serological Reactions and Fermentation Tests.**—*Ibidem*, pp. 327-337, 6 refs.

The purpose of the investigation described in the first paper was to cultivate a number of herpetomonads from different sources and compare their cultural and biological properties. Much of the information has already been noticed [*R.A.E.*, B, xiii, 99; xiv, 133]. Nine strains of *Herpetomonas* have been isolated in pure culture from eight species of insects, and three strains from two species of plants. Four of the cultures were derived from latex-feeding insects (*Oncopeltus fasciatus*, Dall., *Oncopeltus* sp.? and *Lygaeus kalmii*, Stål), and three from latex plants (*Asclepias syriaca* and *A. nivea*); two from mosquitos (*Culex pipiens*, L., and *Anopheles quadrimaculatus*, Say); one from the house-fly (*Musca domestica*, L.); and two from bluebottles (*Calliphora* spp.). In addition, impure cultures have been obtained from *Oncopeltus cingulifer*, Stål, and from its food-plant, *Asclepias curassavica*. All these flagellates can readily be distinguished from *Leishmania* by their rapid growth at 37° C. [98.6° F.], but their differentiation from one another is possible only by serological and fermentation reactions.

The application of these reactions is described in the second paper, and the results are recorded [B, xiv, 133]. It would seem that the biological characteristics of flagellates of the *Herpetomonas* group may be utilised for identification of a species that occurs in different environments and for separation of different species when they occur in the same environment. If *Leishmania* spp. pass the flagellate or herpetomonad stage of their life-history in some invertebrate host, it may be possible by tests of the sort described to distinguish them from the non-pathogenic herpetomonads so widely distributed among insects and plants.

NOGUCHI (H.). **Etiology of Oroya Fever. V. The Experimental Transmission of *Bartonella bacilliformis* by Ticks (*Dermacentor andersoni*).**—*J. Exp. Med.*, xlv, no. 5, pp. 729-734. Baltimore, Md., 1st November 1926.

Two series of experiments are recorded in which *Bartonella bacilliformis* was transmitted from infected to uninfected monkeys, *Macacus rhesus*, by bites of ticks, *Dermacentor venustus*, Banks (*andersoni*, Stiles), but only after a long period of feeding, on both the infected and uninfected animals.

SERGENT (Ed.), DONATIEU (A.), PARROT (L.), LESTOQUARD (F.) & PLANTUREUX (E.). **Etudes expérimentales sur les piroplasmoses bovines d'Algérie (deuxième mémoire).**—*Ann. Inst. Pasteur*, xli, no. 7, pp. 721-784, 23 figs., 10 refs. Paris, July 1927.

This continuation of a previous paper [*R.A.E.*, B, xii, 104] gives an account of the artificial production of relative immunity against the various organisms recorded as causing piroplasmosis of cattle in Algeria.

[OLENEV (N. O.).] **Оленев (Н. О.). On the Classification and Geographical Distribution of Ticks, Ixodoidea.** [In Russian.]—*C.R. Acad. Sci. U.R.S.S.*, 1927, pp. 219–224, 6 figs. [Leningrad, 1927.]

Several new localities, both in European and Asiatic Russia, are recorded for some species of *Argas*; the genus is limited to southern areas, the distribution of *A. persicus*, Oken, being quoted as an example [*R.A.E.*, B, xv, 195].

Ixodes redikorzevi, sp. n., from the Crimea and *Dermacentor birulai*, sp. n., from eastern Tibet are described in French. Three species of *Ixodes* are recorded for the first time from new localities.

The author agrees with Nuttall as regards the synonymy of *I. trianguliceps*, Bir. (*tenuirostris*, Neum.) and *I. putus*, Cambr. (*hirsutus*, Bir.) and also with his view that *Dermacentor niveus*, Neum., is specifically distinct from *D. reticulatus*, F. *D. niveus* has been found in eastern Siberia on horses and sheep.

NICOLLE (C.) & ANDERSON (C.). **Etude comparative de quelques virus récurrents pathogènes pour l'homme.**—*Arch. Inst. Pasteur Tunis*, xvi, no. 2, pp. 123–206, 3 charts, num. refs. Tunis, 1927.

As the result of a series of experiments in the transmission to laboratory animals of various types of relapsing fever, it is concluded that the Spanish and the louse-borne spirochaetes [*Spirochaeta hispanica* and *S. recurrentis*] constitute two distinct species, differing from one another and from the other spirochaetes studied. The spirochaete of African tick fever [*S. duttoni*] and that of *Crocidura stampfli* [*S. crocidurae*] appear to be closely allied, if not identical, the former being endowed with greater pathogenic power and causing a much higher degree of mortality. Attack by *S. duttoni* invariably confers immunity against *S. crocidurae*, though attack by *S. crocidurae* sometimes only confers partial immunity against *S. duttoni*.

The vector of African tick fever is *Ornithodoros moubata*, Murr., that of Spanish relapsing fever, *O. maroccanus*, Velu, and that of European relapsing fever, the louse [*Pediculus*]. The natural vector of *S. crocidurae* has not been determined. *S. hispanica* can be transmitted, at least experimentally, by the louse, and the great length of time (74 days) that virulent spirochaetes can be preserved in the organs of *O. savignyi*, Aud., indicates that this tick is exceptionally capable of transmitting it, although it has not been possible to infect susceptible animals by the bites of the tick [*R.A.E.*, B, xiv, 194].

More recent experiments in the transmission of the spirochaetes studied, by Arthropods other than those whose agency has already been proved, all gave negative results. Thus experiments in the transmission of *S. recurrentis* through *O. savignyi*, *O. moubata* and *O. maroccanus*, of *S. duttoni* through *O. savignyi*, *O. maroccanus* and lice, and of *S. crocidurae* through lice and the three species of *Ornithodoros* all proved unsuccessful.

The authors consider the results of these experiments conclusive where the louse is concerned, as the animals experimented upon were subjected both to bites and to inoculations of crushed lice. The experiments with ticks, on the other hand, were carried out by bites alone, and the negative results obtained with them must therefore be considered inconclusive. The results obtained with *S. hispanica* through *O. maroccanus*, the vector of Spanish relapsing fever, were

very variable, infected individuals coming from Spain and reinfected in Paris proving infectious to the animals bitten, while fresh adults of the same species imported from Morocco and even from Spain, and subsequently infected, were incapable of transmitting even this spirochaete. Further experiments with ticks will therefore be necessary before a conclusive verdict can be arrived at.

O. maroccanus normally lives in pig-styes, but the authors point out that the pig is not susceptible to infection with *S. hispanica* by the bites of this tick, though the latter is infective to susceptible laboratory animals and man, or by inoculation with the infected blood itself; the tick, however, cannot live apart from the pig. The rodents frequenting pig-styes are considered to be the probable reservoir of the spirochaete, the immature ticks being incapable of biting such a thick-skinned animal as the pig, though the adults feed on it. Man is merely an accidental host of the tick and the spirochaete, while the pig is necessary for the nourishment of the adult tick and for providing the conditions requisite for its reproduction. It is also possible that the blood of the pig preserves the spirochaetes in the tick. When man is accompanied by yet another accidental host, the louse, the spirochaete endeavours to adapt itself to the organism of the latter, as in the case of *S. recurrentis*, which has completely detached itself from its probable original hosts, ticks and small mammals, and now depends entirely on two hosts formerly foreign to it, man and the louse.

SAMBON (L. W.). **The "Scrub Itch-Mite" of North Queensland: a new Species of *Trombicula*.**—*Ann. Mag. Nat. Hist.*, (9) xx, no. 115, pp. 157–161, 3 figs. London, July 1927.

Trombicula hirsti, sp. n., is described from North Queensland and compared with *T. wichmanni*, Oudm., from North Celebes and New Guinea. Both species cause a severely itching dermatitis and may possibly be of importance as vectors of local forms of typhus-like fever.

PILLERS (A. W. N.). **Perforations in Pigeons' Feathers due to the Mite, *Falculifer rostratus*, Buchholz.**—*Vet. J.*, lxxxiii, no. 8, pp. 410–413, 4 figs., 6 refs. London, August 1927.

Although the mite, *Falculifer rostratus*, Buchh., has already been recorded as perforating the wing and tail feathers of pigeons and the remedy for it described [*R.A.E.*, B, xii, 200], very little is known of its life-history. There are apparently two types of males, one of which resembles the female, the other having various secondary characters, and there is also a hypopial nymphal form in which the mites are carried to fresh hosts by insects or mammals. The hypopi have been found in the connective and other tissue, including the thymus gland, irrespective of the presence of adults on the skin or feathers, and it has been suggested that in cold countries, such as Finland, the hypopus is a winter form.

SAVAGE (P.). **Kala-azar in the Simla Hills.**—*Ind. Med. Gaz.*, lxii, no. 7, pp. 382–384. Calcutta, July 1927.

The clinical history of two cases of kala-azar at a height of 5,760 ft. is described. That the infection occurred locally appears to be

undoubted. The climatic conditions, a short description of which is given, are certainly unlike those normally conducive to the breeding of *Phlebotomus argentipes*, Ann. & Brun. Sandflies are abundant during the monsoon months and up to the middle of October, but so far only *P. major*, Ann., has been identified. It was found breeding freely in an old horse stable. No individuals could be found in a newly built cowshed.

HINDLE (E.) & PATTON (W. S.). **Transmission Experiments with Chinese Kala Azar.**—*Proc. R. Soc.*, Ser. B, cii, no. B713, pp. 63–71, 4 refs. London, 2nd August 1927.

Experiments are described in which hamsters [*Cricetulus*] were exposed to the bite of infected individuals of *Phlebotomus major* var. *chinensis*, Newst., and *P. sergenti*, Parrot. The animals were also fed on infected sandflies of these species. In both series the results were all negative. Intraperitoneal inoculation of Chinese *Leishmania* from the gut of *P. major* var. *chinensis* and the rubbing of crushed sandflies into the scarred skin of the animal also gave negative results. In the case of intraperitoneal inoculation of flagellates from the gut of *P. sergenti*, 4 out of 46 experiments gave positive results. These sandflies had only fed once, on an infected animal, and had then been kept for a period ranging from 2 to 7 days. As this proportion is greater than that obtained by other investigators with white mice [*R.A.E.*, B, xv, 98] the hamster would seem to be the more susceptible animal. In these experiments flagellates occurred in the mid-gut of *P. sergenti*, but did not occur in the pharynx, so that this sandfly would appear to be a less favourable host than *P. major* var. *chinensis* [*R.A.E.*, B, xv, 178].

GUERRINI (G.). **Topi, pulci e peste in Giappone.** [Rats, Fleas, and Plague in Japan.]—*Giorn. R. Soc. Ital. Igiene*, xlv, no. 1, reprint, 8 pp. Milan, 1927.

Studies on the percentages of plague infection in rats in Japan have shown that *Mus (Epimys) rattus* and *M. (E.) rattus alexandrinus*, which are house-rats, are the important reservoirs, *M. (E.) decumanus*, which does not enter houses unless driven by hunger, being much less heavily infected. Statistics are given showing the percentages of these rats among large numbers taken in various parts of Japan and the percentages of plague infection in each species. In Japan plague is typically an imported disease, the arrival of an infected ship being followed by an epizootic among the rats and then by an epidemic of human plague.

The fleas found were: *Pulex irritans*, very common on man and very rare on rats; *Ctenocephalus canis* and *C. felis*, comparatively common on rats; and the rat-fleas, *Ceratophyllus anisus*, *C. fasciatus* and *Leptopsylla segnis* (*Ctenopsylla musculi*), found everywhere, *Paradoxopsyllus curvispinosus*, a species peculiar to Japan and most common in Tokio, and *Xenopsylla cheopis*, somewhat rare and found only in sea-ports. Counts of the rat-fleas show that they are more numerous in winter, except *X. cheopis*. As a rule they increase slowly from September to January and rapidly from January to February, decreasing in May. *X. cheopis* appears in August, reaches its maximum in November and disappears in March. The rat

epizootic and the human epidemic progress together until the winter, when the latter stops while the former increases, reaching its maximum in January, and then slowly decreasing until it disappears in summer. The epidemic may recur to some extent in spring.

JORDAN (K.) & ROTHSCHILD (N. C.). **Siphonaptera from Borneo.**—*Sarawak Mus. J.*, iii, no. 10, pp. 287–292, 4 figs., 1 ref. Kuching, December 1926. [Recd. 1927.]

More detailed descriptions are given of some of the fleas mentioned in a paper already noticed [*R.A.E.*, B, xv, 14].

NITZULESCU (V.). **Sur le stylet médian de l'appareil buccal de la puce.**—*Bull. Soc. Path. exotique*, xx, no. 6, pp. 467–473, 3 figs., 13 refs. Paris, 1927.

In view of the differences of opinion with regard to the structure and function of the median stylet of fleas, a revision of the anatomy of the buccal apparatus is necessary. Observations on *Ctenocephalus felis*, Bch., show that the stylet is a supporting and sensorial rather than a piercing organ.

SULDEY (E. W.). **Stegomyia et Phlébotome à Bamako (Soudan).**—*Bull. Soc. Path. exotique*, xx, no. 6, pp. 474–475, 1 ref. Paris, 1927.

In referring to Legendre's paper on dengue in West Africa [*R.A.E.*, B, xv, 180], in which he considers that the disease occurs at Bamako in the presence of *Aedes* (*Stegomyia*) [*argenteus*, Poir.], though his view is not based on personal observation, the author states that this mosquito is successfully controlled there by the strict enforcement of regulations. The entire absence of *A. argenteus*, Poir., in certain places where sandflies attacking man occur and authentic cases of dengue have been recorded suggest the possibility of *Phlebotomus* acting as the transmitting agent. Such a hypothesis can only be proved or disproved by a study of these sandflies and their relation to disease.

LEGENDRE (J.). **Poissons larvivores de la Haute-Volta. Technique de l'emploi des poissons contre les maladies à moustiques.**—*Bull. Soc. Path. exotique*, xx, no. 6, pp. 476–480, 18 refs. Paris, 1927.

The importance of fish in the destruction of mosquito larvae is pointed out. *Clarias lazera*, *Schilbe mystus* and *Tilapia nilotica* have been used in the Upper Volta for the control of mosquitos breeding in small collections of water with satisfactory results. The method of handling the fish is briefly discussed.

LEDENTU (G.) & VAUCEL (M.). **Répartition actuelle de la trypanosomiase humaine en Afrique Equatoriale Française.**—*Bull. Soc. Path. exotique*, xx, no. 6, pp. 511–523, 1 map. Paris, 1927.

This is an account of the incidence of sleeping sickness in various localities of French Equatorial Africa, showing the satisfactory results in the reduction of the disease since the adoption of systematic measures in 1925.

DI DOMIZIO (G.). *Trypanosoma brucei* nella Somalia Italiana. Nota I. **Morfologia. Nota II. Tendenza al monoformismo. Raffronti morfologici. Identificazione.** [*T. brucei* in Italian Somaliland. I. Morphology. II. Tendency to Monomorphism. Morphological Comparison. Identification.].—*Nuova Veterinaria*, iv, nos. 10–11, pp. 261–271, 289–297, 11 figs., 4 pls. Bologna, 15th October & 15th November 1926.

The trypanosome usually found in equines in Italian Somaliland and referred to the *brucei-pecaudi* group [*R.A.E.*, B, ix, 180] has been studied from strains obtained from natural infections in equines, a calf and dogs, and from various experimentally infected animals. This polymorphic trypanosome, which is carried by *Glossina pallidipes*, has been identified as *Trypanosoma brucei*. Only a small number out of hundreds of *G. pallidipes* contracted the infection, even if caused to bite at the most favourable times. Development within the fly tends to result in squat forms, whereas in mammals there is a tendency to slender forms.

SHIRCORE (J. O.). **Tanganyika Territory : Annual Medical Report for the Year ending 31st December, 1925.**—147 pp., Dar-es-Salaam, ? 1927.

Cases of the Rhodesian type of sleeping sickness are recorded in A. H. Owen's report from four areas in the Territory. In the area discovered in 1924 [*R.A.E.*, B, xiv, 45], infection now covers approximately 15,000 square miles of country, cases being found in villages widely separated, and only a small proportion of the inhabitants generally being infected. Where there is an increased contact with *Glossina morsitans*, Westw., owing to visits to the forest for hunting or other purposes, or where shortage of food has caused lowered vitality, the disease has occasionally become epidemic. Fourteen cases of sleeping sickness were detected during 1925 on the shores of Lake Tanganyika, where *Glossina palpalis*, R.-D., is numerous. While sleeping sickness of the Rhodesian type shows no signs at present of becoming pandemic in the areas known to be infected, the problem has become sufficiently large to require the creation of a distinct branch of the Medical Department to deal exclusively with the disease.

Ornithodoros moubata, Murr., is widespread throughout the Territory and relapsing fever is common in certain districts. The ticks are very hard to kill, and even survived thorough soaking in cresol. An attempt has been made to provide tick-free camping grounds along an infested route by clearing, burning and fencing areas within which the soil is loosened, thoroughly mixed with oil and again beaten hard over a small space kept as a site for tents.

Comparative tables are given in R. R. Scott's report for Dar-es-Salaam showing the numbers of mosquito larvae found in the township in the years 1923–25, and the numbers found in each month of 1925 compared with the rainfall. Other tables show the recorded breeding-places of Anophelines and the numbers of mosquitos of various genera found in artificial breeding-places in the years 1923–25. The largest number of larvae was found in May and the smallest in September. Malaria notifications in 1924 and 1925 are tabulated, and a list is given of 21 species of mosquitos, taken in Dar-es-Salaam for the most part during

1924 or early 1925, including three species of *Culex* apparently not previously recorded from the town. Two specimens of larvicidal fish have been identified as *Gobius criniger* and *Tilapia nilotica*.

Xenopsylla cheopis, Roths., is recorded from rats in various reports.

LLOYD (L.). **Salivary Secretions of Blood-sucking Insects in Relation to Blood Coagulation.**—*Nature*, cxxi, no. 3036, p. 18. London, 7th January 1928.

It has been found that tsetse-flies (*Glossina*) have both an anti-coagulin in the salivary secretion and a coagulin in the mesenteron, their influence on the coagulation of blood being similar to that of antikinase and kinase respectively. The entire salivary glands of *G. tachinoides*, Westw., may be removed without killing the fly. The flies continue to feed normally, but do not produce any reaction on the most susceptible skin. Though such flies may live as long as 58 days and reproduce normally, sooner or later they choke or get convulsions. It is then found that the lumen of the proboscis and the oesophagus are occluded by a clot, and usually the crop is also full of firmly clotted blood. The function of the secretions in the fly are briefly discussed.

SZILADY (Z.). **Ueber Enderleins Bremsengattung Sziladya und Sziladynus.** [Enderlein's Horse-fly Genera *Sziladya* and *Sziladynus*.]—*Zool. Anz.*, lxxiv, no. 7-10, pp. 202-205, 2 refs. Leipzig, 20th November 1927.

A key given to the species of *Sziladya*, a subgenus of *Tabanus*, and one new species and some subspecies are described.

ENDERLEIN (G.). **Die von Holtz in Griechenland gesammelten Tabaniden.** [The Tabanidae collected by Holtz in Greece.]—*Stettin. ent. Ztg.*, lxxxviii, pt. 1, pp. 99-101, 2 refs. Stettin, 1927.

This list includes one new species.

DE CERQUEIRA FALCÃO (E.). **Myiase palpebral determinada pela *Dermatobia cyaniventris* Macquart 1840.** [Palpebral Myiasis due to *D. hominis*, Say.]—*Brasil-Medico*, xli, no. 40, pp. 1038-1042, 9 refs. Rio de Janeiro, 1st October 1927.

A case of myiasis of the eyelid due to the larva of *Dermatobia hominis*, Say (*cyaniventris*, Macq.) is described. A number of other cases of palpebral myiasis, nearly all Brazilian, are cited.

HOOD (J. D.). **A Blood-sucking Thrips.**—*Entomologist*, lx, no. 772, p. 201. London, September 1927.

The thrips recorded as biting man in Trinidad [*R.A.E.*, B, ix, 175] has now been identified as *Karnyothrips flavipes*, Jones.

PADMANABHA MENON (K.). **Effect of Paris Green on Culicine Larvae.**—*J. Trop. Med. Hyg.*, xxx, no. 15, pp. 193-194. London, 1st August 1927.

Although Paris green is now well known as a floating larvicide for surface-feeding Anopheline larvae, it has apparently not been

tried for the purpose of killing bottom-feeding larvae. If Paris green is shaken with water in a test tube so that the granules become wet, their surface tension is overcome and they sink to the bottom. Tests in Petri dishes having shown that larvae of *Culex pipiens*, L., died within a few hours after Paris green in water had been introduced, a series of experiments were carried out on a larger scale, Paris green being used in dilutions ranging from 1 in 10 to 1 in 40 with various materials, such as algae, organic debris from stored water, etc. Larvae of *C. pipiens* and of *Aedes geniculatus*, Ol., were tested, and most of the mature larvae died within 12 to 24 hours; those that survived were chiefly of the first and second instar, which are probably largely surface feeders and so escaped the insecticide. A few of the larvae pupated and transformed into adults. The tests should be continued on shallow ponds, etc., the Paris green being well shaken with water before being sprayed over the surface. The solubility of Paris green is negligible, and the quantity used is so small that there is no danger to fish or cattle. The arsenic in the water becomes eliminated within 48 hours by some biological process through the agency of aquatic vegetation.

CARNEIRO (H.), DEL NEGRO (C.) & SIMÕES (J. S.). **Inspecção anti-malarica de Guandú (Campos).** [An antimalarial Inspection of Guandú.]—*Folha med.*, viii, no. 20, pp. 241–243. Rio de Janeiro, 16th October 1927.

At Guandú, a village in the state of Rio de Janeiro, the Anophelines captured indoors were *Anopheles argyritarsis*, *A. tarsimaculatus*, *A. intermedius* and *A. brasiliensis*. *A. argyritarsis* (which is the chief vector of malaria in Rio de Janeiro) accounted for 85.1 per cent. of the total.

ZETEK (J.). **Rapid Determination of *Anopheles* Larvae in a new Medium.**—*Amer. J. Trop. Med.*, vii, no. 4, pp. 247–249. Baltimore, Md., July 1927.

It has been found in the Panama Canal Zone that it is unnecessary to treat all waters containing Anopheline larvae, as some only contain harmless species; it is therefore essential to be able to determine quickly and accurately the species met with. The methods of breeding to the adult stage, and of killing and mounting larvae are much too slow, and in ordinary water the movements of the larvae are too rapid for careful examination. The author has made successful determinations in a solution of milk powder, about the consistency of milk, which is placed in the cavity of a culture slide, almost to the level, and into which the larva is introduced by a dropper. The larva comes to the surface and remains very quiet, all that is seen being the palmate hairs, the antennae and the moving mouth brushes. The palmate hairs stand out in bold relief against the white background, and are sufficient for identification by means of an ordinary hand lens. The distinguishing characters of the Anopheline larvae of the Canal Zone, where the chief malaria carriers are *A. albimanus*, Wied., and *A. tarsimaculatus*, Goeldi, as observed in this medium, are described.

CARR (H. P.) & CLARKE (J. L.). **A Study of the Incidence and Distribution Characteristics of Malaria in Rural Areas of Southern Illinois.**—*Amer. J. Trop. Med.*, vii, no. 4, pp. 251–268, 2 maps, 6 refs. Baltimore, Md., July 1927.

Malaria occurs both in the valley lowlands and in the hill areas in Southern Illinois, and the distribution of the disease follows certain physiographical features of the region. In the lowlands, the natural drainage is poor, and conditions are favourable for breeding of *Anopheles quadrimaculatus*, Say; even where considerable agricultural drainage has been carried out, small bodies of more or less permanent water are generally left behind, sufficient for Anopheline breeding. In the hills, malaria is almost always found to occur in persons living within Anopheline flight range from the valley, or else near a smaller stream valley within the hills. The malaria foci have been located on maps, and the detailed data regarding them have been made available for future control work.

[SHVARTZMAN (A. I.).] Шварцман (А. И.). **Malaria in the Cantons of the Tartar Republic in 1925.** [*In Russian.*]—*Russ. J. Trop. Med.*, vi, no. 6, pp. 344–348. Moscow, 1927. (With a Summary in French.)

The malaria incidence in various localities of the Tartar Republic in 1925 is discussed and compared with the two previous years. During 1923 and 1924 the incidence was greatest in June and May respectively, whereas during 1925 two peaks occurred, in May and September, the latter being the highest. In the spring the common infection is benign tertian [*Plasmodium vivax*], whereas in the autumn malignant tertian [*P. praecox*] predominates. The total annual incidence is, however, gradually decreasing.

Anopheles bifurcatus, L., is recorded for the first time from this area, the common species being *A. maculipennis*, Mg.

[POPOV (P. P.).] Попов (П. П.). **On Sandfly Fever and *Phlebotomus* in the Crimea.** [*In Russian.*]—*Russ. J. Trop. Med.*, vi, no. 6, pp. 366–372, 20 refs. Moscow, 1927. (With a Summary in English.)

The history of sandfly fever in the Crimea is reviewed. The authors have identified three species of *Phlebotomus* from this region, viz., *P. papatasi*, Scop., *P. perniciosus*, Newst., and *P. caucasicus*, Marz. Doubt is expressed as to the identity of *P. crimicus*, S. & M. [*R.A.E.*, B, xiv, 190].

[BULKIN (A. K.).] Булкин (А. К.). **Malaria and its Treatment in the Vilyuisk Region of the Yakutsk Autonomous Soviet Republic.** [*In Russian.*]—*Russ. J. Trop. Med.*, vi, no. 6, pp. 374–382. Moscow, 1927. (With a Summary in French.)

Until recently malaria in Russia was almost entirely confined to localised areas with a warm and temperate climate, but owing to the conditions during and since the War, it has now become widespread. In the Vilyuisk region, however, its occurrence cannot be attributed to any movement of troops or refugees, and so far as can be ascertained, the disease has been present for at least about 70 years. Anophelines

are abundant, but apparently have only one generation a year. The first mosquitos were seen at the beginning of July and they had all disappeared after the first half of August.

[YATZENKO (F. I.). Яценко (Ф. И.). **A Review of the Measures for combating Blood-sucking Insects in U.S.S.R. in 1925.** [In Russian.]—Med. Obozr. Nizhn. Povolzh. [Med. Rev. Lower Volga], no. 3-4, reprint 6 pp. Astrakhan, 1927.

The various organisations concerned with medical entomology during 1925 in Russia are enumerated, and references to a number of papers dealing with the subject are given. The work included the regular disinfection of railway carriages against bugs and lice, but by far the greatest attention was paid to the study of malaria and mosquitos.

WILLCOCKS (W.). **Why is Cultivated Egypt immune from Malaria?**—iv+15 pp. Cairo, Nile Mission Press, 1927.

This is the text of a paper communicated to the Institut d'Egypte on 12th December 1927 discussing the importance of clover cultivation as a protection against malaria. In quoting from d'Herelle's book "Immunity in natural infectious Diseases" the author points out that the greater part of Argentina is free from malaria, though mosquitos are abundant and infected persons from malarious districts are frequently present. In all the regions free from malaria a wild scented clover, probably a local variety of *Melilotus altissima*, flowers from the beginning of the summer to the end of the autumn, i.e., during the critical period of malaria. The mosquitos feed on the juice of the highly scented blossoms; this juice contains coumarin, which is also contained in all other plants of this genus. It is suggested that coumarin may have a similar action in the mosquito to that which quinine has in man. These plants do not occur in the malarious districts of Argentina.

Further, according to d'Herelle, malaria has disappeared spontaneously from certain districts in Tuscany, and the mosquitos there are only able to convey malaria of a benign character even from persons infected with the malignant form. In the northern provinces of Holland and certain islands of Zealand the disappearance of malaria has coincided with the introduction of plants of the genus *Melilotus* imported with lupins, though the disease still occurs on islands where lupins are not cultivated.

It is suggested by the author that the wealth of leguminous crops, especially of clovers, occurring in the cultivated areas of Egypt, is responsible for the immunity from malaria of these areas. In carrying out irrigation work in Ismailia, though the drains were kept clear and fish were introduced, no leguminous crops were grown in the areas under cultivation, and malaria, though greatly reduced, was still responsible for the death of a large number of the workmen. Similar areas in which the reclamation work has been followed immediately by the sowing of Egyptian clover are free from malaria.

The continued spread of the larger towns, which drives the clover fields further and further out, is increasing the danger of malaria, and it is suggested that all municipalities in Egypt should have bye-laws

obliging owners of gardens to have areas devoted to Egyptian clover or to the richer wild clovers, which will be allowed to flower and to be cut again and again in flower, as is customary.

In the discussion following this paper the author answered various suggestions as to other factors being responsible for the immunity from malaria of cultivated Egypt, and pointed out how irrigation controls the times at which crops are sown and weeds germinated, and therefore also the times at which they are in flower. There are three seasons in Egypt, winter, summer and autumn; the controlled crops are in flower in early summer, which is the critical time for malaria mosquitos in Egypt. It would be easy in other countries by irrigation to control the times of flowering to coincide with the critical times of malaria mosquitos, whether they occur at the beginning of summer or autumn.

HANCOCK (G. L. R.). **Annual Report of the Assistant Entomologist.**—*Rep. Dept. Agric. Uganda 1926*, pp. 27–29. Entebbe, 1927.

Anopheles gambiae, Giles (*costalis*, Theo.) appears to be the common Anopheline and the most likely to carry malaria at Kampala. Its chief breeding-places seem to be pits dug for clay, some native water-holes and slow-moving water in nearly stagnant ditches; it also occurs in puddles. Up to the present no Anopheline larvae have been found in receptacles containing rain-water. The most practicable method of malaria control in Kampala appears to be mosquito eradication, which will probably involve the further draining of swamps and eventually the filling up of all pits and holes. Larvicides or larvicidal fish may be of use as temporary measures. The most likely fish to be of practical importance is a species of *Haplochromis*, probably *H. nubilis*, which consumed large numbers of Anopheline and Culicine larvae in the laboratory.

CONNAL (S. L. M. S.). **On the Variations occurring in *Aedes argenteus*.** Poirét, in Lagos, Nigeria. —*Bull. Ent. Res.*, xviii, pt. 1, pp. 5–11, 1 pl., 8 figs. London, September 1927. Also in *Rep. Med. Dept. Nigeria 1926*, pp. 132–139. Lagos, 1927.

Since *Aedes argenteus*, Poir., is known to be very variable in colour, 1,000 newly-emerged adults of each sex were examined. The abdomen and hind tarsus showed the greatest variations, and the present paper is restricted to a description of these. The adults resulting from the cross-breeding of individuals with different colour variations are also described.

DUNN (L. H.). **Mosquito Breeding in "Test" Water-containers.**—*Bull. Ent. Res.*, xviii, pt. 1, pp. 17–22. London, September 1927.

From December 1925 to June 1926 detailed observations were made near Lagos in Nigeria on the mosquito breeding that occurred in "test" water-containers, with a view to obtaining further information on the bionomics of *Aedes* (*Stegomyia*) *argenteus*, Poir. (*aegypti*, L.). The methods adopted are described; the sets of containers used each consisted of a section of bamboo and a tin, both containing tap water in which several dried mango leaves were placed, and two similar vessels containing tap water alone. Practically all larvae

collected were reared to the adult stage, and of the 6,590 adults bred, 4,508 were *Aedes argenteus*.

A. argenteus showed a marked preference for the sections of bamboo, this being probably due to their being of wood rather than to any differences in their contents. Water containing leaves appeared to be more attractive than water alone. The distribution of the breeding of *A. argenteus* was found to be somewhat at variance with the commonly accepted opinion that the preferred situations are in the immediate vicinity of habitations, since much breeding occurred in containers 100 yards away from them. The females may prefer places of concealment afforded by grasses and bush at a short distance from habitations to those in the more immediate vicinity of or inside houses. This species showed seasonal variation, the prevalence and breeding decreasing in the dry season and increasing at the beginning of the rainy season.

SCOTT (H.). **Notes on the Distribution and Habits of Culicidae in Central Abyssinia.**—*Bull. Ent. Res.*, xviii, pt. 1, pp. 83–89, 1 pl., 2 figs. London, September 1927.

A list is given of 15 species of mosquitos recorded from Abyssinia, of which all but two were collected in the adult stage by the author during an expedition made to central Abyssinia from September 1926 to January 1927. The topography of the country traversed, the incidence of malaria and the occurrence of the mosquitos are discussed. The Anophelines met with were: *Anopheles gambiae*, Giles, *A. mauritanus*, Grp., *A. pharoensis*, Theo., and *A. transvaalensis*, Cart., while *A. squamosus*, Theo., has been previously recorded from Abyssinia.

WRIGHT (W. R.). **On the Effects of Exposure to raised Temperatures upon the Larvae of certain British Mosquitos.**—*Bull. Ent. Res.*, xviii, pt. 1, pp. 91–94, 2 refs. London, September 1927.

In 1926 experiments were carried out to determine the effect of raised temperatures on the larvae of various mosquitos, the larvae being exposed for 5 minutes unless otherwise stated. The larvae of *Anopheles bifurcatus*, L., did not seem to be affected by temperatures below 31° C. [87·8° F.]; between this and 36° C. [96·8° F.] a varying number died after an exposure of five minutes; 37° C. [98·6° F.] and above killed all larvae. Those experiments would seem to afford an explanation of Buxton's observations [*R.A.E.*, B, xii, 85] that this species breeds mainly in cold waters, such as those of cisterns, caves, etc., and in Palestine can only invade open waters in winter or when they are heavily shaded, since the temperatures in open waters may reach 35–38° C. [95–100·4° F.] in summer. Below 98·6° F. the larvae of *Aedes detritus*, Hal., were not affected; at 44° C. [111·2° F.] and above all because inert and none revived.

Larvae of *Theobaldia annulata*, Schr., are unaffected by temperatures below 34° C. [93·2° F.], but none survived exposure to 98·6° F. and above. Larvae of these three species all died when exposed to a temperature of 35° C. [95° F.] for one hour. The larvae of *Culex pipiens*, L., were not affected by temperatures below 96·8° F., but none survived at 40–41° C. [104–105·8° F.].

The results of experiments with pupae support the observations made by Macfie [*R.A.E.*, B, viii, 156] that they can withstand sudden

exposure to a higher temperature better than the larvae. The pupae of *A. detritus* are, however, exceptional and succumb at a slightly lower temperature than the larvae, none recovering after 5 minutes exposure to temperatures above 42° C. [107·6° F.].

MACKERRAS (I. M.). **Notes on Australian Mosquitoes (Diptera, Culicidae). Part I. The Anophelini of the Mainland. Part II. The Zoogeography of the Subgenus *Ochlerotatus* with Notes on the Species.**—*Proc. Linn. Soc. N.S.W.*, lii, pts. 2 & 3, pp. 33-41 & 284-298, 4 figs., 22 refs. Sydney, July & October 1927.

The Anophelines occurring on the mainland of Australia are *Anopheles punctulatus*, Dön. (in the extreme north), *A. annulipes*, Wlk. (of which *A. mastersi*, Skuse, is considered a synonym), *A. amictus*, Edw., *A. stigmaticus*, Skuse, *A. bancrofti*, Giles, and *A. atratipes*, Skuse. Keys are given to the females and larvae of these species, as well as notes on the male hypopygia. The life-histories of *A. atratipes* and *A. stigmaticus*, and the larva of *A. amictus*, are described for the first time.

The larvae of *A. amictus* were found in company with *A. annulipes* and *Culex basicinctus*, Edw., associated with green algae in running water.

A. atratipes, the male of which is described, is most prevalent in the coastal districts of New South Wales and South Queensland in spring and early summer, apparently disappearing later when other Anophelines are most abundant. The larvae occur in sluggish, slightly muddy creeks with a fine silt bottom. The pH of the water was 7·5; a little aquatic vegetation was present, but no other mosquito larvae were found. This species probably also breeds in pools in sandstone creeks.

The larvae of *A. stigmaticus* were found associated with those of *A. annulipes* in small pools containing filamentous algae in the bed of a small creek. The pupal stage lasts 2-4 days.

In the second part of this paper the faunistic affinities of the Australian species of the subgenus *Ochlerotatus* are discussed. Notes are given on their distribution, and one new species is described. A key to the females of the Australian species of *Aedes* belonging to this subgenus and to the groups *Banksinella* and *Aëdimorphus* is included.

CARTER (H. F.), RUSTOMJEE (K. J.) & SARAVANAMUTTU (E. T.). **Report on Malaria and Anopheline Mosquitoes in Ceylon.**—*Ceylon: Sessional Paper vii*, 1927, 84 pp., 9 pls., 10 maps, 21 charts, refs. Colombo, March 1927.

Much of the previous work on malaria in Ceylon has already been noticed [*R.A.E.*, B, ii, 69, 130, 182; viii, 50; ix, 146]. In many parts of the island the seasons of greatest intensity of the disease appear to be fairly well defined and more or less closely associated with the climatic changes that occur immediately prior to and during the early part of the monsoon periods. These periods include the months of heaviest rainfall. In the south-western and west-central districts (the windward side of the hills in the south-western monsoon) the incidence increases during March and April and reaches its maximum in May; it then rapidly decreases until November, when a second but less pronounced rise, culminating in December and January, begins. In the northern, eastern and south-eastern hills and foot-hills

the periods of increase in incidence are similar, but the rise during the latter months of the year (north-eastern monsoon period) is definitely greater. Throughout the lowlands of the north, north central, east and south-east regions, where the dry season is very long and pronounced, rainfall is confined largely to the season of the north-east monsoon, at which time malaria reaches its greatest intensity, usually in December and January, and from April or May to September or October the case incidence is maintained at a moderate and fairly uniform level. Local conditions, however, may affect to some extent the seasonal incidence of the disease.

The indigenous Anophelines and the means of differentiating them in their adult and larval stages have been dealt with in considerable detail in a paper already noticed [*R.A.E.*, B, xiii, 121; *cf.* also xiii, 166]. Anopheline larvae were found to be much more prevalent in the dry coastal areas of the north-west and south-east, owing largely to the great abundance of larvae of *A. subpictus*, Grassi. There was a marked difference in the relative prevalence of the various species in the dry and wet zones of the low country, *A. culicifacies*, Giles, being very prevalent in the dry coastal areas, and this species and *A. listoni*, List., in the extensive jungle regions of the dry zone, while the swamp-breeding species, *A. hyrcanus*, Pall., *A. jamesi*, Theo., and *A. barbirostris*, Wulp, were predominant in the wet south-west section of the Island. *A. listoni* was prevalent in the foothill districts, other than those of the south-west area. *A. maculatus*, Theo., was absent or scarce in the plains, but increased rapidly with a rise in altitude, while *A. gigas*, Giles, is apparently restricted to elevations of over 3,000 feet. Larvae were found in rice-fields and irrigation channels in all areas under observation, being more abundant in the fields, although those of the more dangerous species, particularly of *A. listoni*, were relatively much more prevalent in the channels.

In all areas except the south-western districts *A. hyrcanus* and *A. subpictus* were predominant in the fields, the former being most abundant when the crop was well-advanced and the latter during cultivation and early growth of the crop and in fallow fields. In those areas of the low country where the spleen rates were high or moderately high an increased prevalence of *A. listoni* or *A. culicifacies* was found in both fields and channels. *A. listoni* was especially prevalent where artificial irrigation from tanks occurred. *A. culicifacies* was found in considerable numbers in the fallow fields of the drier coastal areas, but was also not uncommon in channels in the interior jungle districts. *A. fuliginosus*, Giles, was most prevalent in the coastal districts and was distinctly more numerous in the cultivated than in the uncultivated fields. *A. maculatus* was scarce in both fields and channels in the low country. In the healthy south-western lowlands, where the water was derived from rain and streams, the more active malaria vectors, *A. listoni*, *A. culicifacies* and *A. maculatus*, were scarce in both fields and channels, nearly 90 per cent. of the larvae caught being those of *A. jamesi*, *A. hyrcanus* and *A. barbirostris*. In the hill country districts *A. vagus*, Dön., predominated in the fields, except during the later stages of the growth of the crop. *A. listoni* and *A. maculatus* were, however, moderately abundant when the crop had become established and were also prevalent in the irrigation channels.

Of the Anophelines occurring in Ceylon *A. aitkeni*, James, *A. annandalei*, Prashad, *A. gigas*, Giles, *A. karwari*, James, *A. leucosphyrus*,

Dön., *A. pseudobarbistrois*, Ludlow, and *A. tessellatus*, Theo., are sufficiently uncommon or restricted in their distribution to indicate that they are of little or no economic importance. Observations on the relation between certain species and malaria indicate that the swamp-breeding species, *A. hyrcanus*, *A. barbistrois* and *A. jamesi*, are not active carriers of the disease. The species that from their proportionate distribution would appear to be particularly associated with malaria are *A. culicifacies* and *A. listoni* and, to a less extent, *A. maculatus*, *A. fuliginosus* and *A. subpictus*, though the last-named may be excluded on account of its consistently low susceptibility to infection. Although *A. maculatus* is recognised as the chief carrier of malaria in the hill-country of the Malay States and is associated with an increased prevalence of malaria in the lower elevations of the hill-country in Ceylon, it shows an inverse correlation with malaria prevalence at higher elevations.

Several potentially valuable larvivorous fish belonging chiefly to the genera *Haplochilus*, *Barbus*, *Danio* and *Rasbora* have been found in Ceylon, but the only indigenous species that has been tested in the field is *Haplochilus lineatus*. These fish appear to be definitely more abundant in the south-west, presumably on account of the numerous permanent swamps, pools, etc. It appears that little is to be hoped from the introduction of fish into the large areas of natural water in the dry zone without aiding their action by clearing the weeds, etc., and it is therefore considered that their use should be limited to confined or temporary collections of water, such as wells, shallow flooded areas, etc., since these situations are not only very numerous during the rainy season but are frequently prolific sources of Anophelines, including the dangerous species, *A. culicifacies* and *A. listoni*. The imported fish, *Lebistes reticulatus*, has been successfully bred and has apparently become established in several cases where it has been introduced. Attempts to establish *H. lineatus* have been less successful, and it appears less adaptable to changes of environment and does not thrive well in artificial or artificially treated situations. Although they are probably of relatively little economic importance, over 100 larvae of seven different species obtained from 53 varied breeding-places have been found to be parasitised by Nematodes. It was at first believed that the worms emerged from the mosquito pupa, killing it in the process, but the subsequent discovery of adults parasitised by similar worms indicates that their presence does not necessarily preclude the full development of the mosquito, though the ovaries in these cases were in a rudimentary state. Small biting midges of the genus *Culicoides* (? *C. anophelis*, Edw.) have been found attacking recently engorged mosquitos of several species [*R.A.E.*, B, xiii, 151].

Three anti-malaria campaigns carried out in different parts of Ceylon from 1923-25 are described in detail; the anti-mosquito measures have, with one exception, been of a minor nature, and have included filling, drainage, oiling, jungle clearing, etc., which were apparently the chief measures necessary. The principles on which modern methods of malaria control are based are discussed, and the authors point out some of the difficulties involved in a consideration of the question of malaria prevention in so extensive and varied a country as Ceylon. The first step in the establishment of a definite policy has, however, been made in the appointment of a Malaria Advisory Committee, and a brief outline of the scheme submitted to this Committee is given. It was strongly recommended that, for a period of at

least 10 years, all initial anti-mosquito measures in towns and villages, other than major works, should be carried out by a central malaria organisation.

KOIDZUMI (M.). **The Anophelines of Formosa.** [*In Japanese.*]—*Contr. Dept. Hyg. Govt. Res. Inst. Formosa*, no. 76, pp. 1-68, figs. Taihoku, October 1927. (With a Summary in English.)

The contents of this paper are substantially the same as those of one already noticed [*R.A.E.*, B, xiii, 185]. Two additional *Anophelines*, *Anopheles rossi*, Giles, and a form of the *gigas* type, are also known to occur in the island.

PAPERS NOTICED BY TITLE ONLY.

SINTON (J. A.). **Notes on some Indian species of the Genus *Phlebotomus*.** **xix. The Value of the Female Genitalia in the Identification of Species.** **xx. The Morphology of the Buccal Cavity in some Species.** **xxi. *P. christophersi* n. sp.** [in Punjab].—*Ind. J. Med. Res.*, xv, no. 1, pp. 21-40, 4 pls., 15 refs. Calcutta, July 1927.

DYAR (H. G.) & NÚÑEZ TOVAR (M.). **Notas sobre nuevos dipteros hematofagos de Venezuela (Culicidae).** [Some new blood-sucking Diptera of Venezuela (Culicidae).]—8 pp. Maracay, Venezuela, [8th October] 1927.

EDWARDS (F. W.). **Four new Mosquitos from the Belgian Congo.**—*Rev. zool. afr.*, xv, fasc. 3, pp. 351-355, 4 figs. [Brussels] 15th September 1927.

TAYLOR (F. H.). **Two new Species of Australian Culicidae (Diptera).**—*Bull. Ent. Res.*, xviii, pt. 1, pp. 67-69. London, September 1927.

TAYLOR (F. H.). **A Note on *Simulium bancrofti*, Taylor, with the Description of a new Species of *Simulium* (Dipt.).**—*Bull. Ent. Res.*, xviii, pt. 1, pp. 70-72, 1 pl., 3 refs. London, September 1927.

FOX (C.). **Some new Siphonaptera** [on Rodents in U.S.A.].—*Trans. Amer. Ent. Soc.*, liii, no. 3, pp. 209-212. Philadelphia, Pa., September 1927.

HARDENBERGH (J. G.) & SHEARD (C.). **The possible Role of radiant Therapy in demodectic Mange.**—*J. Amer. Vet. Med. Ass.*, lxxi (N.S. xxiv), no. 5, pp. 607-617, 3 figs., 4 refs. Detroit, Mich., August 1927.

[PAVLOVSKIĖ] PAWLOWSKY (E. N.) & STEIN (A. K.). **Experimentelle Untersuchungen über die Wirkung der Gifthaare der überwinternden Goldafterraupen (*Euproctis chrysorrhoea*) auf die Menschenhaut.** [Experimental Investigations on the Effect of the Poison Hairs of Hibernating Larvae of *Nygmia phaeorrhoea* (*E. chrysorrhoea*) on the Skin of Man.]—*Z. Morph. Oekol. Tiere*, ix, no. 5, pp. 615-637, 14 figs., 25 refs. Berlin, 15th December 1927.

CHORINE (V.). **Les microbes pathogènes de *Galleria mellonella*.** [Bacteria pathogenic to *Galleria mellonella*.]—*Ann. Inst. Pasteur*, xli, no. 10, pp. 1114-1125, 6 figs., 9 refs. Paris, October 1927.

CHORINE (V.). **Sur l'immunisation des chenilles de la mite des abeilles (*Galleria mellonella*).**—*C.R. Soc. Biol.*, xcvi, no. 30, pp. 1288-1290, 1 ref. Paris, November 1927.

SAHARAGI (M.) & MIHARA (Y.). **A List of known Species of Culicidae from Japan.** [*In Japanese.*—*Insect Wld.*, xxxi, no. 11, pp. 362–368. Gifu, November 1927.

A list is given of 56 species of mosquitos from the Japanese Empire.

ROSS (R.). **Malaria-Control in Malaya and Assam. A Visit of Inspection, 1926-7.**—31 pp. London, Ross Inst. & Hosp. Trop. Dis., 1927.

This account of the author's survey of malarial conditions in Malaya and India during 1926–27 is preceded by a popular account of malaria and of the part played by Anophelines in its dissemination, with notes on malaria prevention since 1898. In Ceylon, Malaya, Assam and Calcutta, there is a marked reduction of Culicine mosquitos in the houses of Europeans compared with the conditions in 1881–99, largely due no doubt to the greater knowledge of their breeding habits and to the activities of the local public health departments. As, however, Culicines are the carriers of dengue and elephantiasis, which are still widespread in India, the author strongly advocates that all mosquitos should be placed under still closer control by public action.

Malaria control in Malaya has reached a high state of efficiency, and will possibly result in the elimination of the disease or its reduction to small local outbreaks. In Burma, the progress has been much less marked, owing to the planting community being smaller. In Assam, a state of transition exists, some planters being very progressive, but suffering from the indifference of their neighbours. The whole movement requires unification, and it is suggested that local boards for malaria control should be established for each group of plantations so that the work may be properly organised. In Calcutta, general mosquito control is not nearly effective enough; dengue is prevalent every year, and malaria still exists on the outskirts of the city. The housing of the poorest people urgently requires improvement by legislation. The formation and work of the Co-operative Anti-malaria and Public Health Societies in Bengal, managed by the people themselves, and with many branches in remote villages, is a great step towards effective control, and the organisation of such societies throughout India is desirable.

A note is also given on the conditions observed in Gibraltar. Anophelines are hardly ever seen on the Rock, but until two years ago Culicines, especially *Aedes argenteus*, Poir. (*aegypti*, L.), were very numerous, and yellow fever and dengue have occurred in the past. A recent anti-mosquito campaign, however, appears to have been completely successful.

GRIFFITHS (T. H. D.). ***Anopheles atropos* Dyar and Knab. A Note on its Breeding and other Habits.**—*Publ. Hlth. Rep.*, xlii, no. 29, pp. 1903–1905, 3 refs. Washington, D.C., 22nd July 1927.

Additional descriptive notes on *Anopheles atropos*, D. & K., are given; it is here recorded from Alabama, Mississippi and Louisiana. It only breeds in saline water, its preferred breeding-places being those with a salinity of 3–12 per cent., in permanent salt pools or shallow water on alluvial marshes. It should not be classed as a mud-breeder any more than *A. crucians*, Wied., with which it is frequently associated.

The adults bite both by day and by night and have been found in houses a mile away from the nearest breeding-places. In some localities in marshy areas this mosquito is an even more annoying pest than *Aedes sollicitans*, Wlk.

AICHER (L. C.), LUSH (R. H.) & SMITH (R. C.). **A Year's Test of a so-called Fly Salt.**—*J. Econ. Ent.*, xx, no. 4, pp. 593–602, 1 pl., 1 ref. Geneva, N.Y., August 1927.

The following is taken from the author's abstract: A salt mixture containing 9.77 per cent. free sulphur has been sold extensively under the representation that when cattle are fed on it enough sulphur is secreted with the perspiration to prevent flies from biting the cattle, thereby resulting in greater gains to beef cattle and preventing losses in milk from fly attacks. Two experiments, however, with cattle fed on "fly salt" and common salt showed that the gain in weight in the two herds in 156 days was approximately equal, the dairy cattle showing a very similar decline in milk flow. The salt was also wholly ineffective as a fly repellent, its cost was six times that of common salt, and it was not relished by the animals. It was also discovered during the test that the taste of the milk may be influenced by it under certain conditions.

LARSON (A. O.). **Another Poisonous Caterpillar.**—*J. Econ. Ent.*, xx, no. 4, p. 647. Geneva, N.Y., August 1927.

A painful dermatitis has been caused in Utah, particularly to children playing barefoot in the shade of box-elder trees [*Acer negundo*] by larvae of the Noctuid, *Acronycta (Apatela) americana*, Harr.

FERGUSON (E. W.). **Mosquito Surveys in some inland Towns of New South Wales.**—*Rep. Direct. Publ. Hlth. N.S.W. 1925*, pp. 188–193. Sydney, 1927.

An account is given of the mosquitos of some of the inland towns of New South Wales, including observations on the breeding-places of *Aedes argenteus*, Poir., made during an epidemic of dengue. The usual measures for preventing mosquito breeding are suggested. A chemical analysis of sewage effluent and of water was made to determine whether the hydrogen-ion content would throw any light on the choice of water for breeding by *Culex fatigans*, Wied., but the differences were too slight to show any effect on breeding.

FERGUSON (E. W.) & others. **Investigations into Onchocerciasis in New South Wales.**—*Rep. Direct. Publ. Hlth. N.S.W. 1925*, pp. 193–207. Sydney, 1927.

This account of the work carried out from 1917 to 1920 by the Special Committee appointed by the Commonwealth Council of Science and Industry to investigate the life-history of *Onchocerca gibsoni*, the cause of worm nodules in cattle in New South Wales, consists of three papers, a summary of the experimental work, by E. W. Ferguson, the final report of the committee, by Miss M. Henry, and a detailed account of a series of cattle surveys, by J. B. Cleland and Miss B. M. Somerville, part of which has already been noticed [*R.A.E.*, B, vii, 175].

In an experiment in which two calves were isolated on an island in the Hawkesbury River that had never had stock on it, and which were thus cut off from all possible sources of infection (contaminated water, etc.) except for a herd of infected dairy cattle on the mainland 400 yards distant, one calf was found *post mortem* to be infected with *Onchocerca gutturosa* and the other with *O. gibsoni*. This appears to exclude all but a flying insect as the vector of these filariae. Transmission experiments with Tabanids gave negative results, but cannot be considered conclusive, as conditions were apparently unfavourable. The list of Tabanids occurring in the district in which the experiments were carried out, the nomenclature of which is here revised, has been noticed [R.A.E., B, viii, 173]. In the course of the investigations 12,684 flies, about 90 per cent. of which were Tabanids, were dissected, and microfilariae were found in two species, about 12 times in *Tabanus circumdatus*, Wlk., and twice in *T. innotatus*, Ferg. & Henry; these microfilariae closely resembled those described [from *T. circumdatus*] as *Agamofilaria tabanicola* by Johnston and Bancroft, who considered, however, that they could not be an intermediate stage of *O. gibsoni*. Several hundreds of mosquitos belonging to six species, 50 *Stomoxys calcitrans*, L., and a number of non-biting flies, *Musca domestica*, L., *M. pumila*, Macq. (*vetustissima*, Wlk.) and *Hydrotaea australis*, Mall., all of which infest cattle, were dissected with negative results. The negative results of the examination of many thousands of fresh-water Crustacea for the presence of *Onchocerca* almost justify the conclusion that this group is not concerned in their transmission, and the possibility of earth-borne infection is very small, as the worms appear unfitted for a free existence, and none was found in examinations of soil and grass from places where cattle had slept.

HEYDON (G. M.). **Observations on the Larvae of *Onchocerca gibsoni* (Cleland & Johnston) in the Skin of infected Cattle.**—*Aust. J. Exptl. Biol. Med. Sci.*, iv, pt. 2, pp. 61–68, 1 pl., 10 refs. Adelaide, 16th June 1927.

The occurrence of larvae resembling the microfilariae of *Onchocerca gibsoni* in the superficial layers of the dermis in various parts of the bodies of cattle bearing nodules of *O. gibsoni* in the brisket is described. The occurrence of typical nodules of *O. gibsoni* in the cattle examined did not, however, preclude the possibility of the presence of other species of *Onchocerca*. The fact that in West Africa *O. volvulus* is now known to develop in *Simulium damnosum*, Theo. [R.A.E., B, xiv, 62, 167] increases the probability that in Australia *O. gibsoni* is carried by a Dipterous insect. As it would necessarily be one that imbibes not only blood but also tissue fluid, it seems unlikely that a mosquito is concerned, as its slender proboscis causes the minimum of laceration and abrasion and is possibly inserted directly into a small vessel. Although it is thought that the formation of nodules is a late phenomenon and that mature and fertile worms often live free in the tissues, attempts to find the unencapsuled worms have met with little success. The route of the microfilariae from the parent worm to the skin is apparently not the blood stream, as numerous attempts to find them in the blood have been fruitless; a few have been found in subcutaneous tissues.

WALRAVENS (P.), VAN SACEGHEM (R.), NOKERMAN (E.) & MISSAL (F.).
Contribution à l'étude du *Trypanosoma rodhaini*.—*Ann. Soc. belge Méd. trop.*, vii, no. 2, pp. 171–173, 2 refs. Brussels, November 1927.

Three cases of trypanosomiasis of pigs in Katanga, due to *Trypanosoma rodhaini*, are described. The method of transmission of the trypanosome is not known, but the authors are convinced that it can be transmitted in the absence of *Glossina*. *T. rodhaini* differs morphologically from *T. uniforme* and is pathogenic to monkeys but not to cattle, while the latter is pathogenic to cattle but not to monkeys.

SCHWETZ (J.). **Notes sur la répartition actuelle (en 1925 et 1926) des glossines dans plusieurs régions du Katanga.**—*Ann. Soc. belge Méd. trop.*, vii, no. 2, pp. 111–134, 1 map, 10 refs. Brussels, November 1927.

This is a detailed account, illustrated by a map, of the distribution of *Glossina morsitans*, Westw., and *G. palpalis*, R.-D., in the parts of Katanga, Belgian Congo, visited by the author in 1925 and 1926. Considerable changes have taken place in recent years, *G. morsitans* having receded from Elisabethville and other centres of European occupation following the diminution or disappearance of big game [*R.A.E.*, B, xv, 87].

SCHWETZ (J.). **Notes sur les trypanosomiasés animales du Haut-Katanga.**—*Ann. Soc. belge Méd. trop.*, vii, no. 2, pp. 135–145, 2 refs. Brussels, November 1927.

The author discusses two outbreaks of trypanosomiasis due to *Trypanosoma congolense* that occurred in Katanga in herds of pedigree cattle imported from parts of South Africa where neither trypanosomiasis nor *Glossina* occurs. The trypanosomes, except in one or two animals, were extremely rare both in the lymph and in the peripheral blood. The infection was acquired from native cattle, which were themselves apparently unaffected by it. In both localities tsetse-flies, *G. morsitans*, Westw., in one, and *G. palpalis*, R.-D., in the other, were found, although rare, and were probably responsible for the transmission of the disease. Mechanical transmission may, however, have occurred also, especially in one of the herds, in which one of the affected animals, in close proximity to the healthy ones, was covered with *Musca spectanda*, Wied., *Stomoxys calcitrans*, L., *Tabanus biguttatus*, Wied., and *T. distinctus*, Ric.

Trypanosoma theileri was found in several animals of one of the herds on two occasions, towards and at the end of the epidemic, occurring in the blood of 9 out of 57 animals examined on the second occasion, all of which were negative for *T. congolense*.

Examinations of the blood of 21 head of game, a crocodile and two monitors for the presence of trypanosomes were all negative.

SCHWETZ (J.). **Études et notes d'entomologie médicale sur le Katanga.**—8vo, vi+185 pp., 2 maps. Brussels, J. Lebegue & Cie, 1927.

This book consists of a series of papers recording the results of investigations carried out by the author in Katanga in 1925 and 1926. The papers dealing with the distribution of *Glossina* (tsetse-flies),

ticks and mosquitos and with outbreaks of trypanosomiasis in cattle have been noticed from other sources [*R.A.E.*, B, xv, 87, 103, 120, 121, and above]; in the paper on mosquitos additional tables are included giving details of the dates and localities of those bred and captured in and around Elisabethville from May 1925 to September 1926.

The object of the author's mission was to investigate the possibilities of cattle-raising on a large scale in the province, and in the first two papers he discusses the vegetation and distribution of *Glossina* from this point of view. *G. palpalis*, R.-D., is not found at altitudes above about 3,600 feet, and *G. morsitans*, Westw., is not found above about 5,250 feet, so that the four high grassy plateaux of Katanga are free from these flies, although *G. morsitans* infests their wooded slopes. In addition to the high plateaux there is a huge area of savannah in the Lomami district, where *G. morsitans*, which is confined to the wooded (park) country, does not occur, but where *G. palpalis* occurs in the belts of forest along the rivers. The tops of the high plateaux and, if due precautions are taken, the Lomami district are therefore suited to cattle-raising, providing good pasture; but, except for a few small areas, the rest of Katanga, which is wooded, is infested with *G. morsitans*, and where there is water, with *G. palpalis*, although the latter is not found south of about latitude 12° S.

[EMELIN (V.) & TZEISS (G.).] Емелин (В.) и Цейсс (Г.). **Results of an Expedition for the Purpose of investigating Tropical Diseases of Domestic Animals in South-eastern U.S.S.R.** [*In Russian.*]—*Zh. Eksper. Biol. Med.*, vii, no. 18, pp. 123–132. Moscow, 1927. (With a Summary in German.)

The clinical aspect and treatment of trypanosomiasis (surra) of camels in south-eastern Russia is discussed. The possibility of transmission by bloodsucking Diptera such as *Chrysops*, etc., should be further investigated.

[RUILOV (V. M.).] Рылов (В. М.). **Biological Characteristics of a Habitat of Larvae of *Anopheles plumbeus*, Steph., according to an Analysis of Water from a Hollow in an Ash Tree, *Fraxinus excelsior*.** [*In Russian.*]—*C.R. Acad. Sci. U.R.S.S.*, A, 1927, no. 18, pp. 287–292, 1 fig., 8 refs. Leningrad, 1927.

[KARSTENS (Ё. Ё.) & PAVLOVSKIÏ (Е. N.).] Карстенс (З. З.) и Павловский (Е. Н.). **Analysis of the Water taken from Hollows of the Ash (*Fraxinus excelsior*) and inhabited by Larvae of *Anopheles plumbeus*, Steph.** [*In Russian.*]—*T.c.*, pp. 293–295, 1 fig., 1 ref.

The analysis of water from a tree-hollow inhabited by larvae of *Anopheles plumbeus* is discussed from the hydrobiologist's point of view. Dry residue in the water was very high (8.5700 per cent.), and organic matter prevailed (8.3030), while there was also a high percentage (0.2690) of inorganic substances, particularly striking being the very high content of K_2O (0.0660) and Na_2O (0.1594). Free carbon dioxide in the water was not determined. More exact hydrobiological studies of this type of habitat are urged.

The second paper deals with the quantitative analysis of the water in question.

[TONKOVA (V. V.).] **Тонкова (В. В.). On the Variation in the Eggs of human Lice.** [In Russian.]—*Bull. Acad. Sci. U.R.S.S.*, 1927, no. 5-6, pp. 397-404. Leningrad, 1927.

Cholodkovsky in 1917 pointed out some of the characters by which the eggs of *Pediculus capitis*, *P. humanus* (*vestimenti*) and *Phthirus pubis* (*inguinalis*) can be separated, but these characters being variable, it was thought useful to study the extent of variation by measurements of large numbers and analyses of figures by statistical methods.

The length and width of the eggs were found to be variable in all three species and unsuitable for use in classification. The best character is provided by the height of the operculum, but this only separates the genera, the figures for the two species of *Pediculus* being practically identical.

[MONCHADSKIÏ (A. S.).] **MONTCHADSKY (A.). Morphologische Analyse eines bisher nicht beachteten systematischen Merkmals der Culicidenlarven.** [Morphological analysis of a hitherto unobserved systematic character in Culicid larvae.]—*Bull. Acad. Sci. U.R.S.S.*, 1927, no. 5-6, pp. 479-498, 5 figs., 14 refs. Leningrad, 1927.

The structure of the stigmatic plates (siphonal valves) in 26 species of mosquito larvae is discussed and figured.

[LATUISHEV (N. I.).] **Латышев (Н. И.). Central-Asiatic Forms of Relapsing Fever.** [In Russian.]—*Byull. Obshch. Sodeistv. Oborone Sred. Aziatsk. Voen. Okr.*, 1927, no. 1, reprint, 12 pp., 2 pls., 17 refs. Tashkent, 1927. (With a Summary in English.)

The characters differentiating the Turkestan (Asiatic) form of relapsing fever from that known in Europe are discussed. The latter does not produce immunity from the former, which is identical with Persian relapsing fever and is carried by *Ornithodoros tholozani*, Lab. & Mégn. The author infected himself by the bite of ticks received from an endemic area. The incubation period is believed to be 6-12 days. As spirochaetes were traced in the blood of apparently healthy individuals, the possibility of unrecognised carriers is suggested. The rôle of lice in the transmission of the disease in Turkestan is not yet proved.

FRANÇA (C.). **Relações entre a fitopatologia e a patologia umana.** [Affinities between Phytopathology and Human Pathology.]—*Bol. Soc. Broteriana*, (2) iii, pp. 196-215. Coimbra, 1925.

One example of the similarity between diseases in man and plants is the flagellosis that occurs in *Euphorbia* spp., which is compared with kala-azar. It is due to *Herpetomonas* (*Leptomonas*) *davidi* which, in Portugal, is carried by and develops in the Coreid bug, *Stenocephalus agilis*, Scop. There is also a strong resemblance between the developmental cycle of *H. davidi* and that of *Trypanosoma cruzi*, the causative organism of Chagas disease in South America.

LEGENDRE (J.). **La lutte contre les moustiques par la concurrence larvaire entre zoophiles et androphiles.**—*C.R. Acad. Sci. Fr.*, clxxv, no. 25, pp. 1520–1522. Paris, 1927.

Three years after having brought about the successful substitution at Pons of the man-avoiding race of *Culex pipiens* from Brittany [*R.A.E.*, B, xiii, 26], the author found that, in spite of the fact that the introduced mosquito was breeding freely, not one could be found containing human blood and no complaint of attack could be obtained. It would appear, therefore, that the substitution of the man-avoiding race for the man-attacking one had been maintained. The only difference noted in its behaviour in the new habitat was that it attacked fowls to a certain extent. The inhabitants of localities 10 and 15 miles away were being attacked by mosquitos as before.

MATHIS (C.). **Identité du spirochète de la musaraigne et du spirochète humain dakarois.**—*C.R. Acad. Sci. Fr.*, clxxxvi, no. 1, pp. 46–48, 1 ref. Paris, 1928.

It has been proved that the spirochaete of the shrew, *Spirochaeta crocidurae*, is virulent to man [*R.A.E.*, B, xv, 50]. The spirochaete isolated from the blood of man at Dakar closely resembles it [xv, 53, 204], and the author produces evidence to establish their identity. The transmitting agent remains to be discovered. *Ornithodoros* has not been recorded from Dakar, but an examination of sand from burrows of shrews revealed the presence of some nymphs of other ticks.

Yearly Report of the Public Health Service in the Netherlands Indies for 1924.—*Meded. Dienst Volksgezond. Ned.-Ind.*, Foreign edn., 1927, pt. 2, pp. 201–401. Batavia, 1927.

More or less serious epidemics of malaria occurred in various places during 1924. The commonest mosquitos were *Anopheles (Myzomyia) vagus*, Dön. (*indefinitus*, auct.), *A. (M.) subpictus* var. *malayensis*, Hacker (*rossi*, Giles), *A. (M.) barbirostris*, Wulp, and *A. (M.) ludlowi*, Theo.

During a tour of inspection in Celebes from August to November, the breeding-places along the coast were found to be nearly exclusively those of *A. subpictus* var. *malayensis*, *A. ludlowi* not being found anywhere at that time; numerous breeding-places of *A. (M.) parangensis*, Ludl., were found in the southern part of the island, but there was no indication that this species transmits malaria. In the Moluccas an investigation of *A. (M.) punctulatus*, Dön., and its relation to malaria, which occurs in many localities, is needed.

KOPSTEIN (F.). **The Poisonousness of the Javanese Giant Scorpion** *Heterometrus cyaneus*.—*Meded. Dienst Volksgezond. Ned.-Ind.* Foreign edn., 1927, pt. 3, pp. 504–513. Batavia, 1927.

In a number of experiments it was found that the sting of the Javanese giant scorpion, *Heterometrus cyaneus* (and probably also of *H. longimanus*, *H. fulvipes*, etc.) has comparatively little effect on the smaller mammals; consequently it is not likely to be dangerous to man.

RODENWALDT (E.). **Entomological Notes IV.**—*Meded. Dienst Volksgezond. Ned.-Ind.*, Foreign edn., 1927, pt. 3, pp. 514–523, 1 table, 3 figs. Batavia, 1927.

This is the English version of a paper on the distribution of some Anophelines in the Dutch East Indies already noticed from the Dutch [*R.A.E.*, B, xv, 74].

BRUG (S. L.) & VAN SLOOTEN (J.). **Report of some Experiments on the Efficiency as Insecticides of "Flit," "Rids" and of some other Preparations made at the Medical Laboratory at Weltevreden.**—*Meded. Dienst Volksgezond. Ned.-Ind.*, Foreign edn., 1927, pt. 3, pp. 524–530. Batavia, 1927.

In these experiments with proprietary insecticides, "flit" was found to kill mosquitos and flies very readily, and similar results were obtained with a Dutch insecticide "rids" [*R.A.E.*, B, xv, 20], both the commercial variety and one prepared at the Medical Laboratory at Weltevreden (Batavia) proving satisfactory. Pure kerosene is somewhat inferior to these. The "rids" formula can be simplified and cheapened by omitting the methyl salicylate, a preparation containing 2 parts of carbon tetrachloride (CCl_4) to 100 of kerosene giving equally good results. "Flit" is less to be recommended on account of its irritant effect on the skin, conjunctiva and nasal mucosa, and also because it causes stains. The effect of these insecticides on cockroaches is doubtful unless they can be sprayed repeatedly. The penetrative power of the sprayed fluid was not sufficient to reach bed-bugs [*Cimex*] in all their refuges in native bamboo beds, so that these preparations are not suitable for this purpose. An infested bed was completely freed from bed-bugs by fumigation in formalin vapour at a temperature of 70° C. [158° F.], the eggs even being apparently killed by this treatment.

BRUG (S. L.) & WALCH (E. W.). **Report of an Investigation of a malarial Epidemic in Solo, 1926.**—*Meded. Dienst Volksgezond. Ned. Ind.*, Foreign edn., 1927, pt. 3, pp. 531–579, 8 figs., 2 maps, 2 refs. Batavia, 1927.

Early in December 1925 an epidemic of malaria broke out in the Solo district of Java, the subtertian form predominating. During the investigations, which began in January 1926, no Anopheline larvae were found in a canal, where there was a strong current, though *Anopheles vagus*, Dön., and a few *A. subpictus* var. *malayensis*, Hacker (rossi, Giles) were found in pools on the banks. Later on, when there was no current, larvae of *A. vagus* and *A. fuliginosus*, Giles, were found in the canal. In 649 dissections only a single Anopheline, a specimen of *A. subpictus* var. *malayensis*, was found to be infected with malaria. In one village, in which malaria was very severe, this species was found in greater numbers in the houses than on buffaloes, while with *A. vagus*, *A. aconitus*, Dön., and *A. fuliginosus* the reverse was the case. The potential carriers caught in sufficient numbers to justify the suspicion that they may have played a part in the epidemic were *A. subpictus* var. *malayensis*, *A. aconitus* and *A. fuliginosus*; few specimens of *A. ludlowi*, Theo., and *A. (Cellia) kochi*, Dön., were taken. It was found that *A. fuliginosus*

eagerly attacked man in the open at night ; this is of interest, as large numbers were caught on buffaloes and very few in houses. *A. vagus* also attacked man in the open at night, but *A. subpictus* var. *malayensis*, which was very numerous in the houses, did not do so.

HEADLEE (T. J.) & MILLER (F. W.). **Mosquito Control.**—*Rep. New Jersey Agric. Expt. Sta. 1925-26*, pp. 237-254, 4 pls., 2 refs. New Brunswick, N.J., 1927.

The greater part of the information contained in this report of mosquito work in New Jersey has been noticed from another source [*R.A.E.*, B, xv, 199].

An unusually heavy emergence of upland breeding mosquitos, chiefly *Aedes vexans*, Mg. (*sylvestris*, Theo.) took place in the Upper Passaic Valley in the summer of 1925, when 20,000 adult mosquitos were caught, coated with methylene blue for identification, and released with a view to investigating migration. After 48 hours a migratory movement began, both northwards and southwards in the valley, there being mountain ranges of considerable height to the east and west. Collections were made at various points, each night further from the place of release, until the brood could no longer be traced, 10,000 mosquitos being captured. The results of the investigation will be published later.

LICHTENSTEIN (A.). **Filaria-onderzoek te Bireuën.** [An Investigation on *Filaria* at Bireuën.]—*Geneesk. Tijdschr. Ned.-Ind.*, lxxvii, no. 5, pp. 742-749. Batavia, 1927.

Filariasis is very common in Achin (N.W. Sumatra), and cases of elephantiasis occur. The Anophelines found at Bireuën are *Anopheles ludlowi*, Theo., *A. vagus*, Dön., *A. subpictus* var. *malayensis*, Hacker (*rossi*, Giles), and much less commonly *A. aconitus*, Dön. The Culicines include *Culex fatigans*, Wied., and *Aedes argenteus*, Poir. (*fasciatus*, F.). Attempts to infect *C. fatigans* with the filarial larvae found locally, which differ somewhat from those of *Filaria bancrofti*, failed.

BRUG (S. L.). **Een nieuwe Filaria-soort (*Filaria malayi*) parasiteerende bij den mensch (voorlopige mededeeling).** [A new *Filaria*, *F. malayi*, parasitising Man. Preliminary Communication.]—*Geneesk. Tijdschr. Ned.-Ind.*, lxxvii, no. 5, pp. 750-754, 1 pl., 4 refs. Batavia, 1927.

The filarial larvae referred to above are here described as *Filaria malayi*, sp. n.

COVELL (G.). **A Critical Review of the Data recorded regarding the Transmission of Malaria by the different Species of *Anopheles*; with Notes on Distribution, Habits and Breeding-places.**—*Ind. Med. Res. Mem.*, no. 7, 117 pp., 329 refs. Calcutta, July 1927. Price Rs. 3.4 or 4s. 6d.

In this valuable compilation an attempt has been made to summarise all the recorded information on the distribution, breeding-places, habits and relation to malaria of all species and varieties of *Anopheles* throughout the world, and statistical details are given in tabular form

of all available records of dissection of *Anopheles* for malaria parasites, for both experimental and natural infections. The species are arranged alphabetically and synonyms are indicated, the nomenclature being that given by Christophers [*R.A.E.*, B, xiii, 109], modified only by the adoption of certain changes that have been made and the inclusion of forms that have been described subsequently. Work on the hydrogen-ion concentration of natural waters and the effect of other chemical and biological factors upon Anopheline larvae has not been included.

MELENEY (H. E.), LEE (C. U.) & CHANG (H. L.). **A preliminary Survey of the Anopheline Mosquitos of the Peking Area.**—*China Med. J.*, xli, no. 6, pp. 509–512, 2 refs. Shanghai, June 1927.

Observations carried out in the summer and autumn of 1926 in the neighbourhood of Peking revealed the presence of larvae and adults of *Anopheles hyrcanus* var. *sinensis*, Wied., *A. pattoni*, Christ., and *A. lindesayi*, Giles, the characters distinguishing the adults of which are given. Detailed information in regard to the types of breeding-places used by *A. hyrcanus* var. *sinensis*, which breeds only on the plain (160 ft. above sea-level) and at the foot of hills up to 340 ft., has already been noticed [*R.A.E.*, B, xv, 184]. *A. pattoni* was found to breed chiefly in hill streams, or in ponds near the hills with *A. hyrcanus* var. *sinensis*. Larvae of *A. lindesayi* were found in a spring together with larvae of *A. pattoni* at an altitude of 1,050 ft.

Malaria was more prevalent than usual in the region of Peking during 1926, villages at the foot of the hills, where *A. pattoni* predominated, apparently suffering as much as those in the neighbourhood of breeding-places restricted to *A. hyrcanus* var. *sinensis*, which is known to transmit malaria and is the undoubted vector of the disease in Central China. The possible rôle of *A. pattoni* and *A. lindesayi* as vectors, however, remains to be studied.

[SHCHERBAKOV (S. G.). Щербakov (С. Г.). **On the Biology of hibernating *Anopheles maculipennis*, Mg., in Nizhni-Novgorod and its Environs.**—*Russ. J. Trop. Med.*, v, no. 7, pp. 427–439. Moscow, 1927. (With a Summary in English.)

These observations on *Anopheles maculipennis*, Mg., were carried out during the winter of 1926–27. Dark, damp places, such as cellars, are favoured for hibernation. A certain amount of moisture in the atmosphere is essential, as without it the bodies of the mosquitos dry up fairly quickly. Their activities are reduced gradually as the temperature drops, and at -2.5°C . [27.5°F .] all reactions ceased. Under experimental conditions the mosquitos withstood temperatures of -31°C . [-23.8°F .] and were subsequently able to feed and lay eggs. Their flight ceases at 6.5°C . [43.7°F .], so that they do not attack man below this temperature under natural conditions.

If mosquitos are not fertilised before hibernation, their eggs do not develop after a blood meal. One blood meal is sufficient for the development of fertilised eggs provided the abdomen is not less than half filled. The blood is digested in 72–80 hours, and the eggs develop under winter conditions in 5–9 days, about 78–114 being laid at one time. Mosquitos with fully developed eggs failed to lay them when

they had no access to water, though in one case eggs were laid on damp sand. Eggs laid on 17th February 1927 hatched on 21st February, but the larvae developed very slowly and were all dead by the end of March; this was probably due to lack of suitable food.

An adult of *Vanessa urticae*, L., placed in a jar with several mosquitos was attacked by them, their abdomens being enlarged with the liquid withdrawn.

The *Plasmodium* of malaria appears either to succumb or to develop very slowly in the mosquito when the insect is exposed to low temperatures. This fact and the reduced activity of the mosquitos during the winter suggests that attacks of the disease in winter are due to protracted incubation of the organism in man, or to relapses, rather than to primary infections.

[SPIZHARNUIĖ (I. I.). Спизжарный (И. И.). On the Biology of *Anopheles claviger*, Fabr., in the Environs of Kosino. [In Russian.] —*Arb. Biol. Sta. Kossino*, ii, pp. 77–80, 3 refs. Moscow, 1925. (With a Summary in German.) [Recd. 1927.]

The seasonal history of *Anopheles maculipennis*, Mg. (*claviger*, auct.) at Kosino near Moscow is described. There are three generations a year, the overwintering adults emerging about the second half of April. The occurrence of larvae is apparently directly related to the presence of the algae, *Oedogonium* and *Cladophora*.

SELLA (M.). A new Means of combating *Anopheles* in Italy: An Account of the Aclimatization and Progress of *Gambusia*.—*C.R. Cong. int. Paludisme*, reprint, 16 pp. Rome, 1926. (Abstract in *Publ. Hlth. Rep.*, xlii, no. 34, pp. 2146–2147. Washington, D.C., 26th August 1927.)

After concluding that indigenous fish are of little or no value against mosquito larvae in Italy, the author discusses the success obtained by the introduction of *Gambusia*. Complete destruction of the larvae by this fish is possible, provided that the vegetation is controlled; horizontal vegetation impedes the activities of the fish, whereas vertical vegetation does not.

DOANE (R. W.). Difficulties in Mosquito Control.—*J. Econ. Ent.*, xx, no. 5, pp. 682–684. Geneva, N.Y., October 1927.

When the possibility of mosquito control in the San Francisco Bay region was first demonstrated in 1905, the situation was a comparatively simple one, but it has since been complicated by recent reclamation and industrial projects, which are briefly discussed [cf. *R.A.E.*, B, xv, 25]. Mosquitos also invade the treated areas from those where no measures for their control have been organised. The most common mosquitos breeding in the salt marshes are *Aedes dorsalis*, Mg., and *A. squamiger*, Coq., which may fly or be carried by the wind for several miles. Even the open bay, necessitating a flight of $1\frac{1}{2}$ to 3 miles over the water, does not prevent their migration. Attention is drawn to the necessity for co-operation in suppressing these mosquitos.

BUHÔT (E. W. I.). **Effects on Mosquito Larvae of a Queensland *Nitella*.**—*Proc. Roy. Soc. Qd.* 1926, xxxviii, pp. 59-61, 4 refs. Brisbane, 10th February 1927.

Nitella phauloteles, while harmless to man and domestic animals, is distinctly toxic to mosquito larvae and acts as a repellent to ovipositing adults. It has been tested against the following mosquitos *Aedes argenteus*, Poir. (*Stegomyia fasciata*, F.), *Culex fatigans*, Wied., and *Anopheles (Nyssorhynchus)* sp.

CARPENTER (G. H.). **The Biology of Insects.**—Demy 8vo, xv+473 pp., 16 pls., 88 figs., 16 pp. refs. London, Sidgwick & Jackson Ltd., 1928. Price 16s.

Insect biology is discussed in its various aspects ; structural features of insects are described only in so far as is necessary for the understanding of function and behaviour, while questions of systematic entomology are touched upon only as they bear upon problems of ecology and evolution. The bionomic relations of insects with other organisms, including plants, animals and other insects are discussed, with a short account of the parasitic enemies of insect life. The last chapter deals with insects in their relation to mankind, both as enemies and allies of the cultivator, as household pests, destroyers of buildings and furniture, as disease carriers, as producers of material used for food or industrial purposes, etc.

UCHIDA (S.). **Studies on Amblycerous Mallophaga of Japan.**—*J. Coll. Agric. Tokyo*, ix, no. 1, pp. 1-56, 17 figs., 45 refs. Tokyo, 15th August 1926. [Recd. 1927.]

Eomenacanthus, gen. n., is erected for *Menopon stramineum*, Nitz. (*biseriatum*, Piaget). Five other new genera and 15 new species are described.

NIESCHULZ (O.). **Ueber Schlupfwespen als Parasiten von Tabaniden-eiern auf Java.** [Hymenopterous Parasites of Tabanid Eggs in Java.]—*Centralbl. Bakt.*, IIte. Abt., lxxii, no. 15-24, pp. 399-410, 1 fig., 1 pl., 6 refs. Jena, 30th November 1927.

In view of the relation of Tabanids to surra in Java and the impossibility of controlling them artificially [*R.A.E.*, B, xv, 192], natural enemies have been studied. These include birds, such as *Bubulcus coromandus*, poultry, a predacious wasp (probably a species of *Bembex*), a Libellulid, and Proctotrupids of the genus *Phanurus*. The last-named are the only ones of real importance, and they parasitise large numbers of the eggs. Two species occur in Java and Sumatra and are recorded as *Phanurus* A and B. In the laboratory they attacked the egg-masses of *Tabanus rubidus*, Wied., and *T. striatus*, F., either freshly laid or those 1-4 days old. Unfertilised females of both species produced males only. The adults usually live only two days. In

February and March 1926, 60 per cent. of 1,216 egg-masses found on rice-stalks were parasitised; from the end of March to the beginning of May, 41 per cent. of 65 masses.

POSSON (R. J.). **Experiments in Fly Control are reviewed for the Benefit of Dairy Farmers and Bottlers of Milk.**—*Certified Milk*, v, no. 1, pp. 7 & 23. Chicago, Ill., June 1926.

The best method of controlling flies to prevent the contamination of milk and annoyance to cattle is to eliminate so far as possible all breeding-places by the suitable and timely disposal of manure and bedding. These measures, supplemented by the use of fly-traps and sprays, proved very successful at an experimental farm in Maryland. Cylindrical traps similar to those recommended by Bishopp [*R.A.E.*, B, ix, 158] were used. They were baited with black-strap molasses diluted with 3-4 parts of water. When fermented, this attracts a large number of flies and lasts for several days. It was only necessary to replenish the bait once a week. The spray used for the protection of cattle from horn and stable flies consisted of 1 lb. partially opened dried pyrethrum flowers soaked for 48 hours in 2 U.S. gals. kerosene. In spraying for horn flies [*Lyperosia*] an attempt was made to catch them in a cloud of vapour as they swarmed up after the first spray struck them; this proved very effective. As the stable flies [*Stomoxys*] mostly attack the animal's legs, the spray was directed on to them. The kerosene did not hurt the animals when care was taken not to brush them immediately after spraying.

DECOURSEY (R. M.). **A Bionomical Study of the Cluster Fly, *Pollenia rudis* (Fab.). (Diptera, Calliphoridae.)**—*Ann. Ent. Soc. Amer.*, xx, no. 3, pp. 368-381, 2 pls., 9 refs. Columbus, Ohio, September 1927.

Pollenia rudis, F., is common in most parts of the United States, especially in the autumn, when it frequently seeks hibernation quarters in houses, and again in spring when emerging from hibernation. The literature dealing with this fly, which is scanty, is reviewed, and the life-history and habits are described from observations in captivity. A cold winter kills great numbers of the adults. In houses, some of the commercial sprays used against the house-fly [*Musca domestica*, L.] can be successfully applied to it.

[KALASHNIKOV (S. P.).] КАЛАШНИКОВ (С. П.). **The Question of Arthropod Vectors transmitting infectious Diseases of Animals in the Astrakhan Government.** [*In Russian.*]—*Comm. Inst. Astrakhan Def. Plant.*, i, fasc. 5-6, pp. 37-43. Astrakhan, 1927. (With a Summary in French.)

Piropasmosis of domestic animals, trypanosomiasis of camels (probably surra) and spirochaetosis of poultry are briefly discussed. Their importance and connection with Arthropods (piropasmosis is said to be transmitted by *Hyalomma aegyptium*, L., in Astrakhan) indicates the need for more extensive studies of the subject, particularly in Astrakhan, and for the co-operation of veterinary surgeons and entomologists.

[OLENEV (N. O.). Оленев (Н. О.). **Some Information on the Control of the Tick, *Argas persicus persicus*, F.W.—Parasite and Transmitter of Spirochaetosis of Birds.** [In Russian.]—*Vest. Sovremen. Vet. [Herald Contemp. Vet. Sci.]*, iii, no. 18, pp. 546–549, 1 fig., 3 refs. Moscow, September 1927.

The methods of controlling *Argas persicus*, Oken, employed in America are discussed. The efficacy of painting or spraying fowl houses with crude oil, either alone or mixed with an equal proportion of kerosene, or with carbolineum is confirmed by the author, who recommends their use in southern and central Russia where *A. persicus* is widely distributed. The treatment should be repeated if necessary after 20–30 days, and will also control *Dermanyssus gallinae*, DeG.

DUNN (L. H.). **Studies on the South American Tick, *Ornithodoros venezuelensis* Brumpt, in Colombia.**—*J. Parasit.*, xiii, no. 4, pp. 249–255. Urbana, Ill., June 1927.

The presence of the spirochaetes of relapsing fever in the blood of yellow fever suspects in Colombia and the fact that *Ornithodoros venezuelensis*, Brumpt, was known to be the transmitter of this disease in Panama and Venezuela, prompted an investigation into the importance of the tick in Colombia. The methods employed in collecting the ticks are described, a total of 4,880 being obtained from houses in twenty localities. Positive results were obtained with three batches of ticks that had been confined for 172 days, showing that the spirochaete may remain infective in the tick for a considerable length of time without a blood meal. The interval between collecting the ticks and the making of the tests, varied in other cases from 98 to 23 days. In carrying out the tests an emulsion, made of each batch of ticks by macerating them in 0.5 cc. normal saline solution, was injected in part intra-peritoneally and part subcutaneously, into a white mouse or rat. The results obtained revealed the fact that spirochaetes were present in 27.86 per cent. of the batches tested.

In view of these investigations, it is reasonable to believe that, since a fairly high percentage of *O. venezuelensis*, which is widely distributed over Colombia, is infected with the spirochaete of relapsing fever, this disease is far more prevalent there than is generally realised. In all probability it has been mistaken for yellow fever or malaria in the past, and this would account for the rapid and successful results obtained by using arsenical preparations in some cases thought to be malaria.

[PAVLOVSKIĖ] PAWLOWSKY (E. N.) & STEIN (A. K.). **Experimentelle Untersuchungen über die Wirkung von *Ixodes ricinus* (Ixodidae) auf die Menschenhaut.** [Experimental Investigations on the Action of *I. ricinus* on the Human Skin.]—*Arch. Schiffs u. Tropenhyg.*, xxxi, no. 12, pp. 574–586, 8 figs., 19 refs. Leipzig, December 1927.

Under experimental conditions the saliva of *Ixodes ricinus*, L., produced papules on the human skin. The epidermal reaction of the host to a tick-bite is chiefly due to the effect of the saliva. Organs other than the salivary glands, prepared as emulsions, produced various forms of irritation, but under practical conditions they can be disregarded. The structure of the salivary glands of *I. ricinus* is described.

OUDEMANS (A. C.). **Acarologische Aanteekeningen lxxxviii.** [Acarological Notes, lxxxviii.].—*Ent. Ber.*, vii, no. 158, pp. 257–268. Amsterdam, 1st November 1927.

| In dealing with harvest mites injurious to man, the author does not agree with Hirst in erecting a distinct subgenus for *Trombicula autumnalis*, Shaw, the species concerned in England [*R.A.E.*, B, xiii, 178]. The species involved in France, which has sometimes been recorded as *T. autumnalis*, is *T. inopinatum*, Oudms.

FLETCHER (W.) & FIELD (J. W.). **The Tsutsugamushi Disease in the Federated Malay States.**—*Bull. Inst. Med. Res., F.M.S.*, no. 1 of 1927, 26 pp., 4 pls., 15 refs. London, 1927.

With the exception of a suspected case in 1915, tsutsugamushi disease was not recognised in the Federated Malay States until 1926. The clinical aspects of four cases reported during that year are described in detail.

A general survey is given of the symptoms and aetiology of this disease, compiled from Japanese and Dutch sources. Though it is transmitted in Japan and Formosa by *Trombicula akamushi*, Brumpt, and in Sumatra by *T. deliensis*, Walch, the vector in Malaya has not yet been determined.

SCHULZE (P.) & SCHLOTTKE (E.). **Eine neue Haemaphysalisart aus Angora (Ixod.).** [A new Species of *Haemaphysalis* from Angora.]—*Zool. Anz.*, lxxiv, no. 7–10, pp. 157–159, 7 figs., 1 ref. Leipzig, 20th November 1927.

Haemaphysalis angorensis, sp. n., taken from the ear of a donkey, is described from Angora.

[GALLER (O.) & SASUIKINA (T.).] **Галлер (О.) и Сасыкина (Т.). An Experiment with Chloropicrin for disinfecting Dwellings and Clothing and destroying Insects in them during an Outbreak of Plague.** [In Russian.].—*Rev. Microbiol. Epidemiol.*, vi, pt. 3, pp. 275–279, 3 refs. Saratov, 1927. (With a Summary in French, pp. 373–374.)

During an outbreak of bubonic plague in the Ural Government, the infected dwellings were disinfected with chloropicrin at the rate of 5–10 cc. to the cu. meter for a period of 24–48 hours. Fleas, lice [*Pediculus*] and plague cultures placed for experimental purposes among the folds of clothing, and at different heights, were all killed.

PAPERS NOTICED BY TITLE ONLY.

[PAVLOVSKIĖ (E. N.) & STEIN (A. K.).] **Павловский (Е. Н.) и Штейн (А. К.). Pathological Changes of the Human Skin under the Influence of the Poison Hairs of Hibernating Larvae of *Nygma phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, auct.).** [In Russian.].—*Russ. J. Trop. Med.*, v, no. 7, pp. 445–448. Moscow, 1927. (With a Summary in French, p. 469.) [cf. *R.A.E.*, B, xvi, 32.]

[PERFIL'EV (P. P.).] **Перфильев (П. П.). The Structure of Flea Larvae.** [In Russian.].—*Rev. Microbiol. Epidemiol.*, vi, pt. 3, pp. 329–341, 20 figs., 13 refs. Saratov, 1927. (With a Summary in German, p. 381.)

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- DE FARIA (G.) & CRUZ (O., jr.).** **Sur l'existence d'un stade évolutif intracellulaire du *Trypanosoma cruzi* dans la *Triatoma megista*, Burm.**—*C.R. Soc. Biol.*, xcvi, no. 31, pp. 1355–1357, 3 figs. Paris, 18th November 1927. [See *R.A.E.*, B, xv, 195.]
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WARDLE (R. A.). **The seasonal Frequency of Calliphorine Blowflies in Great Britain.**—*J. Hyg.*, xxvi, no. 4, pp. 441-464, 4 charts, 20 refs. Cambridge, 18th October 1927.

This paper is based on the examination of 26,000 blow-flies caught in traps baited with ox-liver near Manchester between 20th April and 30th October 1926. The data obtained in this industrial locality are compared with those obtained by Graham-Smith at Cambridge, a non-industrial locality [*R.A.E.*, B, iv, 143]. Three traps were placed in an open situation exposed to sun, rain and wind, and three in sheds. Three traps were also placed for several weeks in almost total darkness, but no flies entered them. The percentage ratio of blow-flies captured in the sun to those captured in the shade was 45 : 55 as against 93 : 7 at Cambridge. In the sun 71 per cent. of the flies were *Calliphora* (*C. erythrocephala*, Mg., and *C. vomitoria*, L.), 21 per cent. *Lucilia*, the commonest species of which were *L. caesar*, L., and *L. simulatrix*, Pand., and 8 per cent. *Phormia* (*Protocalliphora*) *groenlandica*, Zett.; in the shade these percentages were 82, 16 and 2. At Cambridge, which is much sunnier, the percentages of *Calliphora* and *Lucilia* were about the same in the shade, but in the sun they were respectively 56 and 43.7.

The curves representing numbers of blow-flies of the three genera throughout the season consist of a number of major and minor peaks separated by depressions, and the author concludes that the major peaks indicate maxima of emergence of successive generations, the minor peaks being caused by interruptions to the attraction of the baits for the flies produced by variations in the rate of surface desiccation of the baits. Low wind velocity, high sunshine value, high temperature and high degree of humidity favour the attraction of the baits, but their influence upon the curve of seasonal frequency is marked only when periods of favourable weather factors coincide with maxima of numerical abundance.

It is believed that these blow-flies have four generations a year at Manchester, the maxima of emergence of each occurring in May, late June, August and late September with *Calliphora*, and in June, July-August and September with *Lucilia* and *P. groenlandica*. The emergence of *Calliphora* in the spring was about a month earlier than that of *Lucilia* and *P. groenlandica*, and its disappearance in the autumn, about a month later, coinciding with the rise and fall, respectively, of the mean daily minimum temperature above and below 5° C. [41° F.]. The main cause of prolonged life-cycles in blow-flies is retardation of the prepupal stage (the period between cessation of larval feeding and beginning of pupal immobility), and it is in this stage that hibernation principally occurs. The author considers that *Lucilia* and *P. groenlandica* are heterodynamic, but *Calliphora* homodynamic cf. *R.A.E.*, B, xi, 55; xv, 85. Owing to the conditions of winter, at any rate in northern England, no generation of *Calliphora* is produced between autumn and spring. Many of the late emerging individuals do not pair, and may hibernate in sheltered situations until the end of the year or possibly longer, emerging during warm, sunny spells. The progeny of the autumn generation, however, remain until early spring chiefly in the prepupal stage, pupate in March and April, and emerge as soon as the mean minimum ground temperature has exceeded 5° C.

The percentage ratio of *Calliphora erythrocephala* to *C. vomitoria* for the whole period from April to November was 58 : 42, but during the summer months *C. vomitoria* was on the whole predominant. The greater rapidity of the rate of increase of *C. vomitoria* during the period April-July may be due to a lower rate of mortality. Dwarf individuals are more frequent in *C. erythrocephala*, and pre-maturation mortality occurs mainly among these dwarf forms. The occurrence of dwarf individuals is almost certainly due to insufficient larval nutrition, but this is probably caused in nature by unsuitability rather than actual insufficiency of food, small pieces of meat desiccating very rapidly in windy or sunny weather ; it is to be expected that *C. erythrocephala*, which breeds freely in small scraps of animal protein matter, would be more liable to be affected in this way than *C. vomitoria*, which breeds mainly in carcases.

Both *C. vomitoria* and *C. erythrocephala* are, on the whole, less attracted to trap baits under open conditions than under sheltered conditions, not on account of negative phototropism, but on account of the lessened attraction of the baits on account of desiccation ; the lessened attraction of desiccated baits is more marked with males than with females and with *C. vomitoria* than with *C. erythrocephala*, owing to lesser powers of olfactory perception of *C. vomitoria* and of the males of both species.

Fifth Report of the Hayling Island Mosquito Control. May 1925 to January 1927.—15 pp., 10 figs. [Hayling Island, Hants, 1927.]

The mosquito infestation in Hayling Island, previous reports of which have already been noticed [*R.A.E.*, B, xii, 132; xiii, 187, etc.], is now generally thought to be under control. If any of the mosquito breeding-places are neglected, however, re-infestation will occur in a comparatively short time. The different forms of control adopted in Hayling Island are discussed. There are three different groups into which the known species of British mosquitos may be divided. The first comprises the domestic mosquitos, such as *Culex pipiens*, L., and *Theobaldia annulata*, Schr., the females of which live in close association with human beings and domestic animals during the winter and are liable to make attacks throughout the year. The second consists of rural mosquitos, which breed in woodland pools and stagnant water of all kinds, and the third of salt marsh or coastal mosquitos, which are capable of flying over two miles, so that although they do not breed near residential districts they can nevertheless reach them. *Aedes (Ochlerotatus) detritus*, Hal., belongs to this group and is found in conjunction with *Aedes caspius*, Pall. Adults are present almost continuously from April to November ; they rarely enter houses, but are far more numerous out of doors than the domestic mosquito.

GINSBURG (J. M.). The Effect of various Chemicals on the Spreading and Penetration of Oils in different Mosquito-breeding Places.—*Proc. 14th Ann. Meeting New Jersey Mosquito Exterm. Assoc.*, pp. 52-64, 17 refs. Somerville, N. J., 1927.

The author's summary of this paper is as follows : Investigations were carried out with the purpose of improving the spreading power of fuel oil used for larvicidal purposes by the addition of certain chemicals. From the various chemicals tested, the tar acids having

hydroxyl (OH) groups (such as phenols, cresols, and xylenols), the monohydric alcohols, pine oil and turpentine increased the spreading power of mineral oils. Cresols and xylenols proved more efficient than the other compounds. Results from laboratory and field tests have definitely shown that the addition of one gallon crude cresol containing 95 per cent. cresylic acids to 100 gallons of fuel oil greatly increased the spreading and penetration of the oil on salt and fresh waters covered with dead organic matter and vegetation. Laboratory measurements have shown that a given quantity of fuel oil containing 1 per cent. crude cresol covered one and one-half times as much water surface as did an equal quantity of the same oil without this chemical. The duration of the oil film was also appreciably increased by this treatment, especially on sewage beds.

NICOLLE (C.) & ANDERSON (C.). **Sur l'origine des fièvres récurrentes humaines.**—*Bull. Inst. Pasteur*, xxv, no. 15, pp. 657–665, 10 refs. Paris, August 1927.

This paper further discusses the conclusions arrived at in a paper previously noticed [*R.A.E.*, B, xvi, 18], and outlines a theory of the evolution of human relapsing fevers through a series of stages the full succession of which may be assumed to have been realised by the most highly developed of the spirochaetes, *Spirochaeta recurrentis* (*obermeieri*).

The most primitive stage is that in which the disease is spread from one small mammal to another by an ectoparasite, which may or may not always be a tick, at which stage the spirochaete [*S. crociduræ*] of the shrew [*Crocidura stampfli*] is found at present. The second stage is reached with the intervention of a specific tick, which involves the introduction of a large mammal indispensable to the life of the adult tick; the pig in the case of *S. hispanica*; cattle or perhaps man in the case of African tick fever [*S. duttoni*], though this is still undetermined. The large mammal may or may not be susceptible to infection by the spirochaete. At the third stage man is introduced into the scheme, though certainly in the case of *S. hispanica*, and possibly in some or all other cases, only as an occasional victim. Tick fever of Central Africa is typical of this stage, being transmitted to man by *Ornithodoros moubala*, Murr., and possibly by other agents, and having small mammals as its probable reservoirs. In this case it is also probable that man is merely an accident in the cycle. At this point the fourth stage is reached with the introduction of the louse [*Pediculus*], consequent upon the intervention of man, the adaptation of the spirochaete to this insect being still imperfect. Spanish relapsing fever is at present at this stage. Up to this point relapsing fever in man has been limited by conditions under which ticks can live, and is therefore endemic to certain soils and to the habitat of certain animals. At the fifth stage, represented by *S. recurrentis*, where the adaptation to the louse becomes perfect, the disease becomes epidemic and universal. Further study of the possibility of the return of this spirochaete to its presumed original host, the tick, is recommended.

The theory that the spirochaetes of large mammals are preserved in small rodents has recently received much support from the discovery of a new spirochaete, *S. normandi*, transmitted by *Ornithodoros normandi*, Larr., in Tunisia [*R.A.E.*, B, xvi, 2].

WALTON (C. L.). **The Control of Tick Infestation and a related Disease of Lambs in North Wales.**—*Parasitology*, xix, no. 3, pp. 265–273. Cambridge, September 1927.

An account is given of a serious infestation of sheep by *Ixodes ricinus*, L., in upland pastures in North Wales. The infestation, which was apparently almost confined to two farms, had existed for a number of years, and a disease of lambs, sometimes fatal, had been associated with it, while the condition of the flocks had deteriorated.

In 1924 the entire flocks were dipped at intervals of about 5 days during May and June, beginning 14 days after they had been turned out on the pastures, using a dip containing arsenic equivalent to 0.2 per cent. As_2O_3 . In 1925 the lambs only were dipped five times, at intervals of 5–6 days, and in 1926 the entire flocks were dipped on 11th May and again after shearing, on 3rd July, the lambs being dipped three times in the interval. When possible, an early autumn series of dips was carried out. The average number of ticks found on each animal was thus reduced from 121 in May 1924 to 0.96 in July 1926, and only three lambs in 1926 were affected by the disease.

DAUBNEY (R.). **Bovine Lymphangitis, or Tropical Actinomycosis.**—*J. Comp. Path.*, xl, pt. 3, pp. 195–216, 8 figs., 12 refs. Croydon, September 1927.

Four cases of lymphangitis causing swellings on various parts of the body in cattle are described from Kenya. Each of the animals was heavily infested with *Amblyomma variegatum*, F., particularly in the neighbourhood of the lesions. There is a popular belief that these ticks are concerned in the transmission of the infection, but no transmission experiments have been carried out with them.

It was possible to demonstrate *Actinomyces farcinicus* in smears of pus from lesions on three of the four animals, and this organism was obtained in pure culture. A typical case of the disease was reproduced in one out of two cattle inoculated with cultures of *A. farcinicus*, and similarly lesions from which the organism was obtained were produced by inoculation of guineapigs. The author considers that the disease, which has previously been recorded from Guadeloupe, is identical with one occurring in India and Sumatra, but draws attention to the fact that no mention is made of *Amblyomma* in the accounts of the disease from the last two countries. In Guadeloupe the disease is believed to be transmitted by ticks, and *Hyalomma aegyptium*, L., has been mentioned in this connection, but this is probably an error for *Amblyomma variegatum*, as no species of *Hyalomma* is recorded from the New World.

GRANOUILIT (—), THU (—) & KHOAN (—). **Contribution à l'étude de la résistance des oeufs et des larves hexapodes d'Ixodides à l'action des vapeurs d'antiseptiques. Utilisation pratique des vapeurs d'ammoniaque.**—*Rev. vét.*, lxxix, pp. 615–619, 1 fig. Toulouse, November 1927.

As ticks of the genus *Haemaphysalis* were numerous in a public pound in Cochin China, tests were made of the effect on them of the vapours from various antiseptic fluids. The technique adopted is described. Against the eggs, of a number of liquids tried, carbolic

acid and ammonia were the only ones that prevented hatching, the latter, however, being effective in one hour while the former was not. By heating volatilisation is increased, and toxicity is obtained in about half an hour. Similar experiments with newly hatched larvae showed that many vapours had no effect on them; carbolic acid, if heated, killed them in a quarter of an hour. With ammonia larvae one or two days old were killed in four minutes. Further tests proved that ordinary commercial liquid ammonia, if heated to boiling point, gives off vapour which, when cooled, kills the larvae in 2 or 3 minutes. The effect of ammonia fumes on the adults is practically negligible. It should be very easy to sterilise dog kennels by means of ammonia, and it has been noticed that ticks never occur in the neighbourhood of manure heaps, doubtless on account of the ammonia evolved from them.

HIRST (L. F.). **Report of the City Microbiologist for 1926.**—*21st Rep. Med. Off. Hlth. Colombo, 1926*, pp. 84-91. Colombo, 1927.

This report includes a summary of the second part of the author's memoir on the parasitology of plague, dealing with the relation of *Xenopsylla cheopis*, Roths., to the epidemiology of the disease [*R.A.E.*, B, xv, 221-223]. Tables showing the seasonal prevalence of *X. cheopis* and *X. astia*, Roths., on *Mus (Rattus) rattus kandiannus* in the endemic plague area in Colombo in 1925 and 1926 and in three districts of the city outside this area in 1926 are given.

HIRST (L. F.). **Rat-flea Surveys and their Use as a Guide to Plague Preventive Measures.**—*Trans. R. Soc. Trop. Med. Hyg.*, xxi, no. 2, pp. 87-108, 4 figs., 10 refs. London, 31st August 1927.

This paper deals with certain aspects of the relation of fleas to bubonic rat plague, with special reference to the author's work in Colombo and the importance of *Xenopsylla cheopis*, Roths., and relative unimportance of *X. astia*, Roths., which have been discussed at greater length in a recent memoir [*R.A.E.*, B, xv, 91, 221]. The author is of the opinion that the difference in efficiency as vectors of plague between *X. cheopis* and *X. astia* is due to the shorter life of the latter and its feebler biting powers, particularly under tropical conditions.

In connection with the establishment of *X. cheopis* in Colombo, where it was unknown until after 1912, the author points out that a foreign species of flea cannot become established on the rats of a locality unless the local conditions permit of more or less continuous breeding; both the climatic conditions and the nesting conditions of the rats must be favourable for it to become sufficiently abundant to give rise to serious outbreaks of a disease such as plague. *X. cheopis* seems to have a marked preference for comparatively dry situations, such as granaries and warehouses, and is not adapted to nesting places out of doors or anywhere liable to marked excess of ground moisture; it reproduces freely between 68° and 78° F., provided that the vapour pressure deficiency does not exceed 0.3 in. of mercury. The favourable temperature range of *X. astia* extends two degrees or so higher than that of *X. cheopis*, and it is much more susceptible to cold and dryness;

in Colombo it seems to have an affinity for rats living in roofs and burrows in the walls of houses, and it is widespread on insectivores as well as rodents.

The flea population of a colony of rats is made up of the fleas infesting the fur of the rats, those in the nests and those scattered abroad by the rats in search of food. The relative size of these components of the population varies greatly with the species of flea, some spending most of their time in the fur, others in the nest and others wandering freely abroad and only seeking the host to feed. The greater the range of the excursion of the rat the more fleas it scatters, and the less the average flea index, *i.e.*, average number of fleas per rat, for that species of rodent. Thus *Mus (Rattus) concolor* wanders further than *M. (R.) rattus* and has a smaller flea index. It must not be assumed that species percentage figures for a collection of rat fleas are a reliable guide to the numerical prevalence of the species found, and that such data may be correlated directly with figures for plague incidence. This is legitimate only when dealing with a zone subject to the same climatic conditions, where the general flea index is more or less uniform throughout; in such a case it is preferable to work on a percentage basis, since the percentage of a species in a collection of rat fleas can be determined with great exactness, while the determination of the flea index is subject to numerous errors.

In Japan the curve of percentage prevalence of *X. cheopis* corresponds closely with that of human plague, but true flea population data are not available. There is indirect evidence that the rat epizootic is continued by *Ceratophyllus fasciatus*, Bosc., in the winter months for some time after the numbers of *X. cheopis* have declined. The author considers it probable that this phenomenon is associated with a closer aggregation of the rats in burrows underground in the winter and a corresponding concentration on them of the nest-infesting *C. fasciatus*, the relative inefficiency of the individual plague-carrying species being temporarily made up for by increased numbers. There is, however, no evidence as yet that *C. fasciatus* or *Leptopsylla segnis*, Schönh. (*musculi*, Dug.) can either initiate a rat epizootic or maintain it for any length of time in the entire absence of *X. cheopis*.

The value of a rat flea survey of a district will largely depend upon the extent and permanence of the irregularities in the distribution of the efficient plague-carrying flea, usually *X. cheopis*. In such a locality as Colombo, where this species is very irregularly distributed, it is possible to concentrate control measures on the actual danger spots, this resulting in great economy and increased efficiency. Practical experience in Colombo, Formosa and the Philippines shows that effective concentration of all available measures on the actual foci liable to be infected is the secret of success in plague eradication. Such work is usually based on accurate rat plague surveys.

In the discussion that followed Dr. A. Balfour referred to the freedom from plague of the Sudan, although it occurred in southern Egypt and had been introduced into Port Sudan and Suakin, and the heat and dryness were little if at all greater than in southern Egypt, while *X. cheopis* was not uncommon at Khartoum. Dr. V. S. Hodson considered that the scantiness of the population and the associated scarcity of animal life of any kind between Assouan and Khartoum were factors of importance in preventing the spread of plague, and that the high temperatures and extreme dryness were also important, providing conditions under which fleas could not flourish. Dr. Hirst said that it

appeared that an *X. cheopis* index of 0.5-1 flea per rat was necessary to maintain a noticeable amount of plague or for it to be indigenous in a locality, and that probably that condition was not fulfilled in the Sudan.

CURSON (H. H.). **A Note on the Trypanosomes of Nagana in South Africa.**—*Trans. R. Soc. Trop. Med. Hyg.*, xxi, no. 2, pp. 109-112, 16 refs. London, 31st August 1927.

As the result of a survey of published and unpublished records the author states that *Trypanosoma congolense*, *T. vivax* and *T. brucei* are known in each of the four territories south of the Zambesi River in which *Glossina* occurs, viz., Zululand, Bechuanaland Protectorate, Southern Rhodesia and Mozambique, *T. congolense* being the most important so far as cattle are concerned and *T. brucei* of little or no importance.

JOHNSON (W. B.) & RAWSON (P. H.). **Use of the Precipitin Test to determine the Food Supply of Tsetse Flies ; a preliminary Note.**—*Trans. R. Soc. Trop. Med. Hyg.*, xxi, no. 2, pp. 135-149, 4 refs. London, 31st August 1927.

By means of antisera, details of the preparation and use of which are given, the authors found that in Northern Nigeria the presence of large numbers of baboons in a locality provides a source of food for both *Glossina tachinoides*, Westw., and *G. morsitans*, Westw. *G. tachinoides* feeds more readily upon baboons than does *G. morsitans*, and this is probably the reason why the former species is able to maintain itself during a scarcity of antelope blood, whereas *G. morsitans* shows evidence of starvation. These flies appear to find the small monkeys more difficult to feed upon, *G. tachinoides* occasionally succeeding in doing so while the more clumsy *G. morsitans* fails.

JOYEUX (C.). **La prophylaxie des helminthiases.**—*Rev. Hyg. Police sanit.*, xlix, no. 7, pp. 499 *et seq.* Paris, July 1927. (Abstract in *Trans. R. Soc. Trop. Med. Hyg.*, xxi, no. 2, pp. 158-159. London, 31st August 1927.)

This is an account of the methods by which helminthic infections of man are acquired, including those in which insects are the intermediate hosts of the worms concerned.

SWYNNERTON (C. F. M.). **Summary of Tsetse Work done in Tanganyika Territory.**—12 pp. typescript. Mombasa, 15th January 1927. [Reed. from Colonial Office.]

Large scale tsetse-fly control work in Tanganyika Territory was begun in 1924 in the Shinyanga district, against *Glossina swynnertoni*, Aust. [*R.A.E.*, B, xiii, 105]. Up to the end of 1926 about 54 square miles of actual clearing had been done in this district, and the fly had been eliminated on an experimental block by thicket-clearing combined with organised grass-burning late in the year and on a second block by fires alone, the area of the two being about 20 square miles; the fly had been so thinned by fires over perhaps a further 200 square miles of bush country that after the fire in 1926 collectors caught an

average of less than one fly a day, whereas after that of 1924 they caught an average of 55. Catching by hand proved of some value as an auxiliary measure, as did also the use of bird-lime on dummies, cars, etc., natural bird-lime being better than synthetic products. The success of the measures in this district was such that by the end of 1926 1,000 new settlers had come into the areas cleared of fly and 40,000 head of cattle had derived benefit during part or all of the year. More than 10,000 people worked for 10 days each on fire-breaks, burning and catching, clearing barriers, and clearing roads to give access to new grazing areas.

The position in other districts of the Territory, in several of which considerable work has been done, is discussed. There is a serious danger of the fly-free cattle country in Shinyanga and elsewhere being reinfested by the railway, as the trains carry large numbers of tsetse-flies from the infested areas; the clearing of a belt 400–500 yards wide on each side of the railway has been undertaken, and it is suggested that native collectors and bird-lime should be carried on the trains. All evidence goes to show that the Central Railway was instrumental in introducing tsetse-flies into considerable areas of country inland from Dar-es-Salaam, where the infestation has become permanent.

ROUBAUD (E.). **Les formes diverses de l'hétérodynamie chez les insectes à plusieurs générations.**—*Bull. Soc. ent. Fr.*, 1927, no. 4, pp. 61–64, 3 refs. Paris, 1927.

The author briefly discusses the phenomenon of "heterodynamy" in insects and points out that several types occur: in heterodynamic Muscids [*R.A.E.*, B, xi, 55; xv, 85] it is cyclic, the diapause occurring regularly after a definite number of generations, fixed by heredity; in the Chalcid, *Melittobia acasta*, Wlk., and *Aedes geniculatus*, Ol. [B, xiv, 123] it is induced, the diapause only occurring if the larvae are subjected to cold, although once it has begun it cannot be terminated by heat. In *Phlebotomus papatasi*, Scop., heterodynamy is not cyclic, but apparently not induced, the diapause occurring in the fourth larval instar in certain individuals of each generation, while others under identical conditions develop rapidly [B, xv, 133].

ROUBAUD (E.). **L'hétérodynamie et le rôle de l'athermobiose dans le cycle évolutif de *Phlebotomus papatasi*.**—*Bull. Soc. Path. exotique*, xx, no. 7, pp. 613–619, 2 figs., 3 refs. Paris, 1927.

Continuing his experiments on the bionomics of *Phlebotomus papatasi*, Scop. [*R.A.E.*, B, xv, 133], the author found that of six females reared from one batch of eggs, two laid eggs all of which produced larvae that developed rapidly at 28° C. [82.4° F.], one laid eggs some of which produced larvae that developed rapidly, while most produced larvae that entered a diapause in the fourth instar, and three laid eggs all of which produced larvae that entered a diapause in the fourth instar. None of the inactive larvae had resumed development after more than four months at a constant temperature of 28° C. Inactive larvae subjected to lower temperatures (16–18° C. [60.8–64.4° F.]) for one or two months resumed activity and completed their development when again placed in a temperature of 28° C., the resumption of activity being more general and the completion of development more rapid with larvae that had entered the diapause several months before

being subjected to a low temperature than with those that had entered the diapause only one month before, except in the case of those subjected to cold for two months, all of which completed their development rapidly. In another experiment larvae that were reared at 28° C. and had entered a diapause were kept at room temperature (16–22° C. [60·8–71·6° F.]); none had pupated after six months.

Dryness did not reactivate inactive larvae, all dying within 18 hours when placed in a medium that was gradually dried.

A large proportion of the larvae of *P. papatasii* cannot, therefore, complete their development without passing through the winter, and it is remarkable that this dependence on cold for reactivation should be characteristic of a species that is able to live in the Sudan, where there is no true winter, while it does not occur in *P. perniciosus*, Newst., which lives in temperate regions with cold winters. It must be supposed that the night temperatures in the Sudan are sufficiently low to reactivate *P. papatasii*.

CHARRIER (H.). **Note préliminaire sur les mouches de la région de Tanger.**—*Bull. Soc. Path. exotique*, xx, no. 7, pp. 619–622, 2 refs. Paris, 1927.

The Diptera of Morocco have been very little studied, in spite of their importance as vectors of disease. The author gives a list of 18 species of MUSCIDAE and ANTHOMYIIDAE found in houses in and around Tangier, the most abundant of which are *Muscina stabulans*, Fall., *Fannia canicularis*, L., *F. incisurata*, Zett., *Stomoxys calcitrans*, L., and *Musca domestica*, L., which occur throughout the year with little variation in numbers, while *Pyrellia cadaverina*, L., and *Cryptolucilia caesarion*, Mg., are very common, particularly on the outskirts of the town, during the heat of the summer. Other Diptera that occur in houses include *Calliphora vomitoria*, L., and *C. erythrocephala*, Mg., Sarcophagids, mainly *Sarcophaga carnaria*, L., and occasionally *Hippoboscæ equina*, L. The large number of animals continually present in all parts of the town and the insanitary conditions are responsible for the abundance of flies associated with animals.

MATHIS (C.). **Foyer endémique de typhus récurrent à Dakar.**—*Bull. Soc. Path. exotique*, xx, no. 7, pp. 700–704, 6 refs. Paris, 1927.

The author records the occurrence of three further cases of relapsing fever at Dakar [cf. *R.A.E.*, B, xv, 53, 204], all natives, making a total of five cases in less than a year, and concludes that this disease is endemic there, the spirochaete [which has subsequently been proved to be *Spirochaeta crociduræ*, *R.A.E.*, B, xvi, 39] being found to be the same in each instance. An emulsion of lice [*Pediculus*] taken from a man suffering from the disease was inoculated into two mice, one of which showed numerous spirochaetes in the blood after two days.

MATHIS (C.). **Transmission expérimentale du spirochète de la musaraigne par le pou.**—*C.R. Acad. Sci. Fr.*, clxxxvi, no. 3, pp. 177–179, 1 ref. Paris, 1928.

In these experiments the author was successful in transmitting *Spirochaeta crociduræ* from one monkey to another by inoculation of crushed lice [*Pediculus*], which others have failed to do [*R.A.E.*, B,

xvi, 18]. The louse cannot, however, be the natural vector of *S. crocidurae* since it is not an ectoparasite of the shrew [*Crocidura stampli*]. It is more probable that the spirochaete is transmitted from the shrew to man by a tick not yet known. But the fact that the louse is capable of harbouring the spirochaete shows that it might play a part, in certain conditions, in converting an endemic infection into an epidemic.

WILBERT (R.) & DELORME (M.). **Sur une spirochétose ictéro-hémorragique du chimpanzé transmissible à l'homme.**—*Ann. Inst. Pasteur*, xli, no. 11, pp. 1139–1155, 8 refs. Paris, November 1927.

Among chimpanzees in French Guinea that had been in contact with others recently introduced from the Ivory Coast (where yellow fever occurs), the authors discovered a spirochaetal disease that resembled infectious jaundice or even yellow fever. The epidemiology and symptoms of the disease are discussed, and the causal agent, which resembles *Leptospira icteroides*, is described as *Spirochaeta anthropopitheci*, sp. n. The vector has not been determined; rats and bats, both of which frequently harbour spirochaetes, often visit the houses where the chimpanzees are lodged, and Arthropods that occur in the neighbourhood, any of which might be concerned in transmitting the disease, include various ticks, lice [*Pediculus*] (often found in numbers on young chimpanzees) and mosquitos, among which are *Aëdes argenteus*, Poir. (*Stegomyia fasciata*, F.) and *A. africanus*, Theo. Inoculations of infected blood were made into anthropoid apes and monkeys, dogs, rabbits, guineapigs and mice, but a few of the guineapigs and two chimpanzees were the only animals that gave positive results. During the course of these investigations, one of the authors became infected and inoculated some of his blood in which spirochaetes were visible into a chimpanzee, which died two days later with all the symptoms of the disease. He had no recollection of exposing himself to infection during the autopsies or by direct contact, but was being constantly bitten by mosquitoes, including both *Anopheles* and *Aëdes*.

NICOLLE (C.) & ANDERSON (C.). **D'une erreur commune dans la conduite des expériences portant sur la détermination des agents de transmission des spirochétoses et de la même erreur dans toutes les investigations analogues.**—*Arch. Inst. Pasteur Tunis*, xvi, no. 3, pp. 228–232. Tunis, September 1927.

The authors point out the fallacy of assuming that, if an emulsion of an Arthropod that has been allowed to feed on an animal infected with spirochaetosis or other disease produces the disease when inoculated into a susceptible animal, the Arthropod is a natural vector of the disease. It cannot be considered as proved that any Arthropod is the vector of a disease unless the means by which it transmits it naturally can be shown. In the case of louse-borne relapsing fever, however, the spirochaetes [*Spirochaeta recurrentis*] undergo development in the louse [*Pediculus*], appearing finally in the circulatory system, whence they cannot reach the mouth-parts, and it is only by crushing the louse, which is done readily by the pressure of clothes or the finger nail, that the spirochaetes can gain access to the human body, either through abrasions in the skin or by being conveyed to the conjunctiva on the

finger, this being the natural mode of infection. Ticks on the contrary, cannot be crushed by pressure of clothes or the finger nail, and it is impossible that crushing them should provide a natural means of infection.

The fact that the causal organism of a disease can persist and retain its pathogenicity for some time in an invertebrate cannot be adduced as a proof that the invertebrate is a vector, although if a spirochaete persists for a long time in a tick related to species that have been proved to transmit spirochaetes it may be considered possible that it is a vector. On the other hand it may merely be evidence of an incomplete adaptation, such as must have preceded all the perfected adaptations of spirochaetes to their vectors that exist.

BLANC (G.) & CAMINOPETROS (J.). **Nouvelle enquête sur la répartition du bouton d'Orient en Grèce. Un foyer continental en Laconie-Péloponèse.**—*Ann. Inst. Pasteur*, xli, no. 9, pp. 1002-1021, 3 figs., 9 refs. Paris, September 1927.

Oriental sore has not hitherto been definitely recorded as occurring on the mainland of Greece, although it is known to be endemic on the north coast of Crete. The authors have ascertained that there is an endemic focus of the disease at Neapolis, near the south-eastern extremity of the Peloponnese, and that it occurs elsewhere in the same region. Both at Neapolis and in Crete the disease is extremely localised, spreading very little from the foci, and its distribution seems to be determined by some factor or factors other than the abundance of *Phlebotomus*. The authors are of the opinion that direct transmission occurs between infected and healthy persons, and that this accounts for the peculiarities of distribution [*cf. R.A.E.*, B, ix, 81].

PARROT (L.) & DONATIEN (A.). **Le parasite du bouton d'Orient chez le phlébotome. Infection naturelle et infection expérimentale de *Phlebotomus papatasi* (Scop.).**—*Arch. Inst. Pasteur Algérie*, v, no. 1, pp. 9-21, 4 pls., 1 fig., 5 refs. Algiers, March 1927.

A summary of this paper on observations in Algeria has already been noticed [*R.A.E.*, B, xv, 28]. Four females of *Phlebotomus papatasi*, Scop., were dissected 32-48 hours after feeding on mice experimentally infected with *Leishmania tropica*, and their stomach contents, in which Herpetomonads were very numerous, were inoculated into mice. None of these showed any sign of infection after two months, and it is concluded that the Herpetomonads had not reached an infective stage.

[POPOV (P. P.).] (Попов П. П.). **Tentative Study of the *Phlebotomus* of Russia.**—*Russ. J. Trop. Med.*, 1926, no. 9-10, pp. 43-65, 5 figs. Moscow, 1926. [Reed. 1928.]

The second part of this monograph [*R.A.E.*, B, xiv, 203] deals with the general biology of *Phlebotomus* and their preparation for examination. The measurements of the antennae only permit of the determination of the females of five species, viz., *P. papatasi*, Scop., *P. sergenti*, Parrot, *P. perniciosus*, Newst., *P. minutus*, Rond., and *P. caucasicus*, Marz. A key to the males is given.

FAUST (E. C.). **Linguatulids (Order Acarina) from Man and other Hosts in China.**—*Amer. J. Trop. Med.*, vii, no. 5, pp. 311-325, 2 pls., 1 fig., 13 refs. Baltimore, Md., September 1927.

The Linguatulids, *Armillifer moniliformis*, Diesing, from the liver of man, *Linguatula serrata*, Froehlich, from the lung of a rabbit, *Kiricephalus pattoni*, Stephens, from the lung of a cat, and *Reighardia sterna*, Diesing, from the lung and hepatic portal blood of *Sierna fluviatilis*, are recorded from China, and systematic and descriptive notes on them are given. All the specimens studied were nymphs.

SHROPSHIRE (J. B.) & ZETEK (J.). **Unusual Anopheles Habitats in the Canal Zone.**—*Amer. J. Trop. Med.*, vii, no. 5, pp. 331-338, 4 figs., 2 refs. Baltimore, Md., September 1927.

Anopheles albimanus, Wied., and *A. tarsimaculatus*, Goeldi, are the principal vectors of malaria in the Panama Canal Zone. *A. albimanus* commonly breeds in fresh water exposed to sunlight, and *A. tarsimaculatus* in swampy areas near the coast where the water is slightly brackish, although it is also found in fresh water in association with *A. albimanus*. Three breeding-places are described in which both these species occurred in abundance in water that was more than 50 per cent. sea water. Larvae transferred from salt water with a salinity of 0.003 to sea water with a salinity of 0.015 pupated and produced adults, as did also large larvae transferred from fresh water to sea water with a salinity of 0.019, the duration of the pupal stage being shortened and small larvae failing to pupate in the latter case. *A. albimanus* and *A. tarsimaculatus* were also found in several other unusual breeding-places, including a concrete trough, steel water tanks and crab-holes, the larvae having probably been washed into the crab-holes by heavy rains. *A. albimanus* was once found in a tree-hole near a house, and *A. argyritarsis*, R.-D., has not infrequently been found breeding in tins hidden by tall grass, etc., near houses.

ROOT (F. M.). **Studies on Brazilian Mosquitoes. IV. Notes on some Brazilian Species of Anopheles.**—*Amer. J. Hyg.*, vii, no. 5, pp. 599-605, 2 pls., 9 refs. Baltimore, Md., September 1927.

In consequence of the fact that the male Anopheline formerly described by the author as that of *Anopheles lutzi*, Cruz, is now known to belong to some species of the *Nyssorhynchus* group [*R.A.E.*, B, xii, 181], the male genitalia of the *Myzorhynchella* group remained undescribed. As the result of comparison of specimens of *A. parvus*, Chagas, and *A. lutzi* found in Brazil in 1925, both of which belong to the latter group, it is concluded that they are probably distinct species. The male hypopygium of *A. parvus* is described, and the differences between the hypopygial structures of this species and those of species of the *Nyssorhynchus* group are pointed out. The larva of *A. parvus* is also described by comparison with *A. argyritarsis*, R.-D., which it closely resembles.

The male hypopygium of a specimen of *Anopheles rockefelleri*, Peryassú, bred in Brazil in 1924, has been found to agree exactly with Bonne's description of the male genitalia of *A. mediopunctatus*, Theo. [*R.A.E.*, B, xii, 25], of which *A. rockefelleri* is therefore considered a synonym.

Comparison of specimens from Brazil and Central America confirmed the opinion of Howard, Dyar and Knab that *A. tibiamaculata*, Neiva, is a synonym of *A. eiseni*, Coq. *A. fluminensis*, sp. n., possibly previously identified as *A. mediopunctatus*, is described from two males bred from larvae collected in the coastal lowlands of Rio de Janeiro in 1925.

DA COSTA LIMA (A.). **Sur la respiration des larves d'*Anopheles albimanus*, Wied.**—*C.R. Soc. Biol.*, xcvi, no. 27, pp. 1092–1093. Paris, 21st October 1927.

Studies of the behaviour of larvae of *Anopheles albimanus*, Wied., showed that they do not live so long in water without breathing air at the surface as the Culicines previously studied in Para [*R.A.E.*, B, ii, 107], and confirmed the conclusion that the extent to which the larvae adapt themselves to purely aquatic respiration is in proportion to their size, a young larva living 126 hours when breathing exclusively air dissolved in water, while a larva three times its size lived only 26 hours under the same conditions.

HUFF (C. G.). **Studies on the Infectivity of Plasmodia of Birds for Mosquitoes, with special Reference to the Problem of Immunity in the Mosquito.**—*Amer. J. Hyg.*, vii, no. 6, pp. 706–734, 4 figs., 21 refs. Baltimore, Md., November 1927.

Previous work on the infection of mosquitos with bird malaria is briefly reviewed, and the methods and aims of the author's investigations are explained. Three strains of *Plasmodium*, which are considered to be distinct species, were used, the hosts being sparrows (*Passer domesticus*) and canaries (*Serinus canarius*). Of the twelve species of mosquitos with which a sufficient number of experiments was performed to be of significance oocysts were found in the stomach and sporozoites in the salivary glands of *Culex salinarius*, Coq., *C. territans*, Wlk., *C. pipiens*, L., *C. fatigans*, Wied. (*quinquefasciatus*, Say) and *Aedes argenteus*, Poir. (*aegypti*, L.) after feeding on infected birds, all being infected by *Plasmodium cathemerium* and *P. inconstans*, and the first three by *P. praecox*; negative results were obtained with five other species of *Aedes*, *Anopheles punctipennis*, Say, and *Psorophora sayi*, D. & K. Only three successful transmission experiments were carried out, mainly owing to the difficulty of inducing the infected mosquitos to feed a second time. *Plasmodium cathemerium* was transmitted from infected to healthy canaries by *Culex pipiens* and *C. salinarius*, 17–18 days after the infecting meal, and *P. inconstans* by *C. pipiens*, 13 days after the infecting meal.

It was thought that the immunity of certain species of mosquitos from infection by *Plasmodium* might be due to the fact that they digested the parasites before they formed ookinetes and penetrated into the gut wall, but comparisons of the length of life of the asexual forms and the behaviour of the sexual forms in the stomachs of *Aedes sollicitans*, Wlk., which is immune, and *Culex pipiens* showed that this hypothesis could not be retained, ookinetes appearing in each species after 12 hours and remaining for at least 20 hours. It was also found that certain individuals of a susceptible species were immune. It is suggested that the immunity of non-susceptible mosquitos may be atreptic.

Considerable differences were observed in the readiness with which the various species of mosquitos would feed on birds. *Aedes argenteus* and four of the five species of *Aedes* that were immune from infection fed readily, while only a few individuals of *A. canadensis*, Theo., would feed at a time. *Culex pipiens* and *Psorophora sayi* also fed readily, but *C. territans* was not attracted to the birds and only fed if it happened to walk across the exposed part of the skin. Seven species, including *Culex apicalis*, Adams, and *Aedes atlanticus*, D. & K., could not be induced to feed. It is thought probable that *C. pipiens* is the principal vector of bird malaria in the United States. The feeding of 50 or more *C. pipiens* on a bird caused it no injury or discomfort, while the feeding of 4 or 5 *Aedes vexans*, Mg., or *A. cantator*, Coq., caused it to struggle and produced inflammation.

TAO (SHAN MING). **A Comparative Study of the early Larval Stages of some common Flies.**—*Amer. J. Hyg.*, vii, no. 6, pp. 735-761, 7 pls., 42 refs. Baltimore, Md., November 1927.

Various species of common flies were reared from females caught at Baltimore with the object of studying the characters of the early larval stages. The methods employed in breeding are described. Keys are given to the first and second stage larvae of a number of genera of the families CALLIPHORIDAE, MUSCIDAE, ANTHOMYIIDAE and SARCOPHAGIDAE, and distinctions between the first and second stage larvae, applicable to these families, are indicated. The first and second stage larvae of *Musca domestica*, L., *Muscina stabulans*, Fall., *Stomoxys calcitrans*, L., *Lucilia sericata*, Mg., *Calliphora erythrocephala*, Mg., *Cynomyia cadaverina*, R.-D., *Phormia regina*, Mg., *P. (Protophormia) terraenovae*, R.-D., *Cochliomyia macellaria*, F., *Ophyra* sp., *Fannia canicularis*, L., and *F. scalaris*, F., and of the genus *Sarcophaga*, and the first stage larva of *Pollenia rudis*, F., are described.

GAY (D. M.) & SELLARDS (A. W.). **The Fate of *Leptospira icteroides* and *Leptospira icterohaemorrhagiae* in the Mosquito, *Aedes aegypti*.**—*Ann. Trop. Med. Parasit.*, xxi, no. 3, pp. 321-342, 1 diagram, 19 refs. Liverpool, 10th October 1927.

Previous work on the transmission of *Leptospira* by insects is reviewed, and it is pointed out that experimental and clinical observations afford strong presumptive evidence that *L. icterohaemorrhagiae* is transmitted in nature in a contaminative manner and not by an insect vector, while *Aedes argenteus*, Poir. (*aegypti*, L.) should serve as a true intermediate host of *L. icteroides* if this organism is the cause of yellow fever.

The authors experimented with *Aedes argenteus* bred in the laboratory and with a strain of *Leptospira icterohaemorrhagiae* obtained from rats killed in Boston, Massachusetts, in 1925 and a strain of *L. icteroides* isolated from a patient suffering from yellow fever in Brazil in 1923, both strains having been kept at a high degree of virulence by continuous passage in guineapigs. *L. icterohaemorrhagiae* and *L. icteroides* behaved in a similar manner in *A. argenteus*. Neither was transmitted from guineapig to guineapig or to human volunteers by the bite of the mosquito at widely varying intervals after its ingestion. After the ingestion of either strain by the mosquito *Leptospira* diminished rapidly in numbers in the first few days, then more slowly, and finally

disappeared altogether. In exceptional instances each strain persisted in small numbers in the mosquito for three weeks after ingestion and retained its virulence, as demonstrated by the injection of mosquitos into guineapigs, but did not persist for longer periods (26-46 days).

The authors consider that these observations furnish additional evidence of the identity of *L. icterohaemorrhagiae* and *L. icteroides*, and they point out that they diminish in numbers in *A. argenteus* in the manner of a micro-organism in an unsuitable host, their behaviour being the opposite of that shown by the virus of yellow fever, which is not infective until about 12 days after the mosquito has bitten a yellow fever patient, but persists throughout the life of the mosquito and may possibly increase in it.

BARBER (M. A.), KOMP (W. H. W.) & HAYNE (T. B.). **The Susceptibility to Malaria Parasites and the Relation to the Transmission of Malaria of the Species of *Anopheles* common in Southern United States.**—*Publ. Hlth. Rep.*, xlii, no. 41, pp. 2487-2502, 44 refs. Washington, D.C., 14th October 1927.

The susceptibility of the Anophelines in the southern United States to malaria parasites is discussed from previous data and recent observations. The three commonest species, *Anopheles quadrimaculatus*, Say, *A. punctipennis*, Say, and *A. crucians*, Wied., are all readily infected with malaria parasites in the laboratory and all have been found infected under natural conditions, *A. quadrimaculatus* and *A. crucians* with sporozoites in the salivary glands, the former generally showing the highest percentage of infection. All three species enter dwellings, but the numbers of *A. quadrimaculatus* in them far exceed those of either of the other species. It is, moreover, the summer species of widest distribution, and while the avidity for human blood and the blood preferences of different species varies with time and locality, epidemiological evidence indicates that it is the most important malaria carrier in the southern United States. The other two species, however, may also be involved. *A. punctipennis* has been proved capable of transmitting malaria to man under laboratory conditions.

BARBER (M. A.) & KOMP (W. H. W.). **Some Tests of the Larvicide "Stoxal."**—*Publ. Hlth. Rep.*, xlii, no. 31, pp. 1997-2004, 3 refs. Washington, D.C., 5th August 1927.

Tests have been made to compare the efficiency of "stoxal," a proprietary insecticide already noticed [*R.A.E.*, B, xiv, 121] with that of Paris green and trioxymethylene (paraformaldehyde) in mosquito control. Stoxal is a dust, the active principle of which is trioxymethylene, to which is added a fine dry powder to prevent too rapid wetting and to make the material float better and otherwise render it more likely to be ingested by the larvae. In the mixture used, trioxymethylene was present at the rate of 32.5 per cent. to 67.5 per cent. inert ingredients; it was not diluted, and care was taken to ensure that none of the material was exposed to the air for long before application. The tests were made against Anophelines and Culicines, both in the laboratory and in the field. In the tests against the latter, in which trioxymethylene and stoxal were used, neither gave satisfactory results. In the tests made against Anophelines in the laboratory, details of which are given, very varied results were obtained;

in almost all cases the dosage was far in excess of any that could be economically used in the field, and no test showed a higher efficiency from stoxal than from the other substances. In the field 27 lb. stoxal to an acre gave an efficiency of 85 per cent., 10·2 lb. trioxymethylene gave nearly 90 per cent., while 3 lb. Paris green mixed with 300 lb. road dust killed nearly all the larvae. From these tests it would seem that, at least in America, stoxal is of very little use, since for Culicines there are few places where oil or fish would not be more economical, and in such places trioxymethylene alone, or diluted with a less expensive dust than that used with it in stoxal, would be fully as efficient; for Anophelines Paris green is certainly cheaper than stoxal, and is used in such small quantities that it does not poison the water.

LE PRINCE (J. A.) & others. **Mosquito Control by Airplane.**—*Publ. Hlth. Rep.*, xlii, no. 38, pp. 2337–2338. Washington, D.C., 23rd September 1927.

Experiments in Virginia [*R.A.E.*, B, xv, 94] having shown the value of aeroplane dusting with Paris green against Anopheline larvae, a demonstration of the procedure was given in South Carolina. On the day preceding the demonstration, the area of water chosen, the surface of which was shaded by trees and bushes, yielded an average of 5 larvae of *Anopheles quadrimaculatus*, Say, to the dip, 11 out of every 13 dips securing larvae. The aeroplane flew about 50 ft. above the tree-tops, distributing the dust in strips about 220 yards apart over the entire 500 acres. The mixture was composed of equal parts of Paris green and soapstone, 2 lb. being used to an acre. Two trips were made on each of which a load of 500 lb. was carried, the whole flight occupying $1\frac{1}{2}$ hrs. No living larvae were found in the small clear spaces 2 hrs. after the commencement of the flight, and many dead ones were secured, while in areas covered with trees and bushes all the full-grown larvae were dead, though some of the first stage larvae were still alive. A further and more thorough investigation 22 hrs. after the flight revealed 3 living larvae, 6 pupae and 84 dead larvae in a series of 703 dips.

Studies of the Malaria Problem in Porto Rico.—*Porto Rico Health Rev.*, ii, no. 10, pp. 27–32. April 1927. (Abstract in *Publ. Hlth. Rep.*, xlii, no. 39, p. 2395. Washington, D.C., 30th September 1927.)

Anopheles albimanus, Wied., was more numerous than *A. grabhami*, Theo., which was not found at 40 per cent. of the night collecting stations at all; only 7 per cent. of the latter were taken on human beings or in dwellings at night, but it was numerous on domestic animals. All the night stations were in, or bordering on, sugar-cane fields and in half of them *A. vestitipennis*, D. & K., was caught at some time during the year, a large number being taken in marshy areas, while during the wet season larvae were numerous in temporary water deposits in the cane field ditches. There are no records of this mosquito biting any domestic animal except the horse. Of these three species *A. vestitipennis* is the most active feeder, and can be kept alive in the laboratory for at least 2 weeks, while it will feed on human blood more readily than *A. albimanus* or particularly *A. grabhami*.

The average of night and day catches of all species of *Anopheles* shows the greatest rise in November with a smaller one in August.

GRIFFITTS (T. H. D.). **Moist Sand Method of applying Paris Green for Destruction of Subsurface Feeding Mosquito Larvae.**—*Publ. Hlth. Rep.*, xlii, no. 44, pp. 2701-2705, 1 ref. Washington, D.C., 4th November 1927.

In a preliminary experiment, made to discover a method by which Paris green, which has proved satisfactory against Anopheline larvae, might be applied to Culicine larvae below the surface or at the bottom of the water, a brackish pool, heavily infested with the larvae of *Aedes taeniorhynchus*, Wied., and *A. sollicitans*, Wlk., was treated with a heavy mixture of Paris green and wet sand. A certain amount of the mixture sank to the bottom, the rest remaining on the surface, so that in all cases when Anophelines were present, sufficient was left to kill these as well as *Aedes*; in 24 hrs. all the larvae were killed. Following this a large number of experiments were made in the field and the laboratory in Mississippi, almost all resulting in at least 98 per cent. mortality of the larvae of the two species mentioned above as well as of *Culex fatigans*, Wied. (*quinquefasciatus*, Say), *Anopheles crucians*, Wied., *Aedes argenteus*, Poir. (*aegypti*, L.), *Culex salinarius*, Coq., and *Psorophora ciliata*, F., the last named being probably killed by feeding on the poisoned larvae of *A. sollicitans*. In four out of the fifteen experiments 1 lb. Paris green and 99 lb. moist sand were used to an acre. Microscopical examination of the grains of sand mixed with Paris green in this manner showed that a large percentage of them have particles of the Paris green adhering; it would also appear that the toxicity of the Paris green applied by this method continues for a longer period, especially when used in artificial containers, than is the case when it is used as a dust on the surface. As salt marsh mosquitoes generally breed in relatively shallow water, this method is particularly successful against them, and although the dose might have to be adjusted to meet conditions in deep containers or large tanks, there is no doubt as to its effectiveness in the destruction of *A. argenteus* and other species that breed in shallow containers.

DALAL (P. A.) & MADON (E. E.). **A new Diluent for Paris Green.**—*Ind. Med. Gaz.*, lxii, no. 10, pp. 554-555. Calcutta, October 1927.

Further investigations have been made regarding the control of Anophelines in Bombay millponds [*R.A.E.*, B, xiv, 199] with particular reference to the small domestic cisterns and the sprinkler tanks built on high towers for the purpose of flooding the cotton mills in case of fire. Oiling was obviously impossible for these cisterns. Insect powders with a pyrethrum basis were tried, but they did not prevent Anopheline larvae from maturing in cisterns in which the water is replaced as it is used and had no effect on the eggs and very little on the pupae. Paris green was then used, and as most of the tanks are roofless, it was important to find a diluent that would not be affected by breezes blowing across the surface of the water. Cork powder, sawdust, fine road dust and flue-dust were all tried, but the best material for the purpose was French chalk. This material forms a very thin film on the surface, which lasts for about 4 days if the water is undisturbed as in the case of a closed tank, and which quickly re-forms on an open tank when disturbed by wind. The mixture recommended is 40 grains Paris green to 8 oz. French chalk for about

500 sq. ft. water surface. Sublimed sulphur also seemed satisfactory as a diluent in basin experiments, but has no special advantage over French chalk. The successful experiments described were carried out against larvae of *Anopheles stephensi*, List., in a cistern the water of which was constantly replenished. No larvae of this species were found in the stagnant water of a sprinkler tank close by.

SCHARFF (J. W.). **Report on a Mosquito and Sanitary Survey of Labuan, with Notes upon Anti-mosquito Measures proposed.**—*Malayan Med. J.*, ii, no. 3, pp. 88–93, 1 fig., 5 refs. Singapore, September 1927.

The topography of the island of Labuan is described, and the sanitary conditions are discussed. Malaria is very prevalent throughout the year, accounting for 13–17 per cent. of the total deaths in 1924–26. Notes are given on the breeding-places of Anophelines observed. Larvae of *Anopheles ludlowi*, Theo., were abundant wherever the salinity of the water was adequate, except in some pools in which the fish, *Panchax panchax*, occurred and the mosquito larvae were unprotected by the presence of a coarse grass or the green alga, *Enteromorpha intestinalis*; the occurrence of the latter is often a useful indication of breeding. Larvae of *A. separatus*, Leic., were next in abundance after those of *A. ludlowi*, being found in open pools of peaty water, while *A. umbrosus*, Theo., was found in small numbers in two well-shaded pools containing apparently similar water. *A. barbirostris*, Wulp, was common inland in both densely and sparsely shaded pools. *A. karwari*, James, was fairly numerous in fresh flowing water, but *A. maculatus*, Theo., which is usually associated with it in Malaya, and is there the chief carrier of malaria, was entirely absent. Other Anophelines found breeding were *A. hyrcanus* var. *sinensis*, Wied., *A. vagus*, Dön., and *A. kochi*, Dön. No larvae were found in rice-fields, possibly owing to the presence of much rotting vegetation when they lie fallow.

From a consideration of the spleen rates amongst children in the vicinity of the breeding-places of the various species the author concludes that *A. ludlowi* is the principal vector of malaria in the island, while *A. umbrosus* may also play some part in the spread of the disease, but that it is unlikely that *A. barbirostris* is of any importance. The ability of *A. separatus* to transmit malaria should be investigated, although it is relatively harmless in Malaya. The proposals for anti-malarial work, for the purpose of which an annual sum of about £820 has been allotted, are outlined. An inspector has been appointed whose first duty will be to eradicate *A. ludlowi* within half a mile of the chief centre of population. About £350 a year will be spent on oiling, as a temporary measure, and £470 on permanent reclamation and drainage work.

MUNRO (A. C.). **An Experiment in Mosquito-proofing Barracks of British Troops.**—*J. Roy. Army Med. Corps*, xlix, no. 4, pp. 248–255, 1 fig. London, October 1927.

The two stations of Lahore and Amritsar in the Punjab are extremely malarious after the monsoon, from about August to October, and

conditions are such that mosquito eradication is impracticable, although oiling and other measures for the control of Anopheline larvae have been carried out for a number of years.

Details are given of the means by which the British barracks at Amritsar and a part of those at Lahore were rendered mosquito-proof, using wire gauze with 16 meshes to the inch. This work was begun in 1925 and completed by July 1926, and monthly fumigations were carried out subsequently. As the result of these measures, in 1926, when malaria was as prevalent as usual in the Punjab, and no special campaign against mosquito larvae was carried out, the malarial rate in mosquito-proof barracks in Amritsar was one-fourth the average rate in the same barracks for the three preceding years, and the malaria rate in mosquito-proof barracks in Lahore was one-fifth the average rate in the same barracks in the three preceding years and less than one-third the rate in unprotected barracks in the station in the same year.

The author concludes that mosquito-proofing of barracks, properly carried out, is a certain means of reducing malaria among troops under peace conditions, by protecting them absolutely for the majority of the dangerous hours, *i.e.*, between sunset and sunrise.

YAMADA (S.) & KOMORI (K.). From what Point of the Proboscis of the Mosquito do developed Larvae of *Filaria bancrofti* escape?—Sci. Rep. Govt. Inst. Infect. Dis. 1926, v, pp. 647-651, 1 pl., 9 refs. Tokyo [1927].

The authors found developed larvae of *Filaria bancrofti* in the labium of *Anopheles hyrcanus* var. *sinensis*, Wied., *Culex tritaeniorhynchus*, Giles, *C. sinensis*, Theo., *C. whitmorei*, Giles, *C. vagans*, Wied. (*tipuliformis*, Theo.), *C. pipiens* var. *pallens*, Coq., and *Aedes togoi*, Theo., in Japan, and observed their escape from a number of individuals of the last two species. The larvae emerged through the tips of the labella, as observed by Mochizuki, and in no case through Dutton's membrane, as claimed by other authors. The authors conclude from their experiments and observations that the larvae can escape from the labium by rupturing the tips of the labella when a stimulus such as pressure or heat is given to the labium, and also spontaneously even when their hosts are fed on sugar solution.

The morphology of the labella and their junction with the labium is described.

CRAWFORD (J. A.) & CHALAM (B. S.). Mosquito Reduction and Malarial Prevention. A Précis.—2nd edn., 8vo, xvi+107 pp., 9 pls., 2 diagrams, 23 figs., 16 refs. London, &c., Oxford Univ. Press, 1927. Price 4s. 6d. or Rs. 3.

In the second edition of this book [*cf.* *R.A.E.*, B, xv, 79] a few minor alterations and additions have been made, and an appendix on Paris green and its use as a larvicide against Anophelines has been added.

SCHARFF (J. W.). Notes on Practical Measures of Malaria Prevention from the Point of View of Mosquito Control.—Malayan Med. J., ii, no. 2, pp. 49-56. Singapore, June 1927.

This is an account of malaria control work carried out in the Singapore rural area from 1921 to 1927, the results of which have been

extremely satisfactory. It was found that the incidence of malaria corresponded very closely with the extent of breeding-places of *Anopheles maculatus*, Theo., which was the only mosquito found to be infected in the area, and efforts were concentrated on controlling the larvae of this species. Other measures included enforcing the whitewashing of the interiors of village houses, the effect of whitewash in making houses less attractive to mosquitos being of considerable value.

Against the larvae of *A. maculatus* oiling and subsoil drainage were carried out, and the latter method was found to be the more satisfactory. Details are given of the cost of controlling breeding in the same places by the two methods, and it is shown that the capital cost of drainage is only 3-5 times the annually recurring cost of oiling, and the cost of maintenance of the drains for an indefinite period, provided that tile and not concrete pipes are used, is estimated at 3 per cent. of the original outlay. Oiling on the large scale necessary for scattered villages is not satisfactory, requiring constant supervision, although it is usually effective on plantations, but as an auxiliary measure to drainage it cannot be entirely dispensed with.

The oil used consists of 50 parts Solar oil, 4 parts kerosene and 10 parts crude (fuel) oil, and is considered to be the most efficient mixture for the control of mosquito larvae. It has been compared with other mixtures, taking into account cost, power to produce a fine spray, spreading power, toxicity to larvae and toxicity to vegetation. Another mixture that has been recommended, consisting of 56 parts crude oil and 8 parts kerosene, is slightly cheaper. Crude oil alone will not spray properly, and kerosene is an essential ingredient, as it appears to be the most toxic.

On one estate an apparatus has been devised to provide a continuous drip of oil on a stream down which Anopheline larvae are carried. A water tank is superimposed on an oil tank, into which the water is siphoned, causing the displacement of oil at a regular rate. The rate of the drip is regulated by a tap in the pipe through which the water is siphoned. In this apparatus 4 gals. oil last 12 days.

The use of Paris green presents the serious objection, in addition to its poisonousness, that it does not kill vegetation, and there is nothing to show that it has been applied efficiently except the absence of mosquito larvae, so that constant supervision is necessary.

In the discussion that followed the reading of this paper K. B. Williamson said that a campaign aiming at the extermination of a species of Anopheline, although costly, should result in a large future saving in control measures and a great improvement in health. He thought that *Anopheles ludlowi*, Theo., might be exterminated in Singapore Island and possibly further greatly reduced in the Malay Peninsula, as it is confined to the coast and the river estuaries; waters in which it breeds in populous districts might be dealt with by routine measures and those in uninhabited districts by gassing. The great difficulty of malaria control in plantations arises from the fact that they continue more or less permanently in a condition approximating to open jungle; since the Anophelines chiefly responsible for the transmission of malaria, *A. maculatus* in rubber plantations and *A. umbrosus*, Theo., in coconut groves, are replenished respectively from the jungle fringes and the jungles themselves, there is no hope of exterminating them on the mainland of the Peninsula. Local preventive measures are alone possible, and for native holdings in rural areas these must be cheap and permanent, the best known at present being open

agriculture. In connection with malaria control in coconut groves it is suggested that if enough nitrogenous and other organic matter, of vegetable or animal origin, is present in water to use up the dissolved oxygen, kill the algae and promote putrefaction, the breeding of Anophelines, particularly the most dangerous species, which, in Malaya, with the possible exception of *A. ludlowi*, appear to breed in pure and well oxygenated water, should be prevented. In Krian, rice-fields are apparently free from Anopheline larvae while the heavy crop of fallow reeds is rotted in deep water, and breeding ceases in the ditches as soon as they become polluted with rotting fish at the time of the fish harvest. Many of the most important vectors of malaria in different parts of the world appear to breed in pure water, and it seems possible that the physiological qualities of the body fluids of the adults may resemble those of the larvae, and that the presence of nitrogenous toxins, possibly related to deficient oxidation, may inhibit the development of malaria parasites in the adults of mosquitos that breed in foul water. It may be significant that in man the parasites occur in the red corpuscles, which are the best oxygenated constituents of the blood. Some Anophelines, such as *A. kochi*, Dön., and *A. hyrcanus* var. *sinensis*, Wied., which carry little or no malaria in Malaya, are responsible for epidemics in Sumatra, and it would be interesting to know whether they have acquired the ability to breed in purer water there than in Malaya. A large part of the matter ingested by Anopheline larvae in Malaya is completely disorganised and dead, and the grading of species according to the quality of their breeding-water seems to be more likely to be brought about by unsuitability of food, leading to food poisoning, than by any other single cause. Solid organic matter in a fouled medium is not improbably liable to absorb and concentrate organic poisons, and each fragment of putrescible matter cannot but serve as a nidus for bacteria, some of which are doubtless the cause of larval disease. Accepting the hypothesis that pure water species are kept from breeding in even slightly fouled water by either poisoning or infectious disease, it seems much more probable that the responsible factors are food poisoning and food infection than that they are changes in hydrogen-ion concentration or problematically present poisonous nitrogenous bases in solution. Micro-organisms, especially bacteria, which prepare the way for or prevent the breeding of Anophelines by the changes that they bring about in the organic content of the water, are controlled and caused to multiply or die out by much smaller concentrations of substances in the water than will affect mosquito larvae themselves; it ought, therefore, to be cheaper to exterminate larvae by the intermediary of bacteria than to poison them directly. Mineralisation of small bodies of water, however, should prove as effective as fouling, and gas lime is suggested for this purpose, as the sulphuretted hydrogen and other chemicals that it liberates are poisonous to insects without being deadly to mammals under outdoor conditions.

DUNN (L. H.). **Tree-holes and Mosquito breeding in West Africa.**—*Bull. Ent. Res.*, xviii, pt. 2, pp. 139-144, 4 tables. London, December 1927.

This paper describes a later investigation [cf. *R.A.E.*, B, xiv, 219] of mosquito breeding occurring in tree-holes in the vicinity of Lagos, which was made during the rainy season of 1926. Water was collected

from holes in 260 trees, which included 35 species consisting largely of fruit, shade and ornamental trees. Mosquito larvae were present in 87.3 per cent. of the trees from which samples of water were taken, and 13 species were found, including all those found in the previous investigation.

Aedes argenteus, Poir. (*aegypti*, L.) was second in frequency of occurrence and fourth in the number of adults bred, and was present in 26.9 per cent. of the trees. It did not seem to have any preference for particular kinds of trees, nor did it attempt to select tree-holes containing clear water in which to oviposit. More than 71 per cent. of the holes in which larvae were obtained were less than 10 ft. above the ground, and the highest point at which they were taken was 22 ft. The amount of breeding found occurring in tree-holes was sufficient to demonstrate the necessity for their elimination as a measure in yellow fever control.

DUNN (L. H.). **Observations on the Oviposition of *Aedes aegypti*, Linn., in Relation to Distance from Habitations.**—*Bull. Ent. Res.*, xviii, pt. 2, pp. 145–148, 2 tables. London, December 1927.

An account is given of experiments in Nigeria to determine if *Aedes argenteus*, Poir. (*aegypti*, L.) prefers places of oviposition within habitations or those situated outside with natural shelter near by, and also the distance from dwellings at which this species could breed. The conclusions drawn are that preference is shown for oviposition in water-containers (bamboo sections) situated outside houses, with bushes and trees near to provide places of rest and concealment, as compared with containers of a similar type inside houses. *A. argenteus* may oviposit in water-containers 500 yards from human habitations with no known nearer source of blood supply.

Reference is also made to other species found in the containers.

BUXTON (P. A.). **Sur les moustiques de Tahiti et du Groupe des Iles de la Société.**—*Bull. Soc. Etudes océaniques*, no. 21, pp. 306–308. Papeete, Tahiti, October 1927.

With the exception of introduced species, all the fauna of Melanesia and Polynesia is of western origin, and consequently diminishes eastwards. Only four species of mosquitos are known from Tahiti (Society Islands), *Culex fatigans*, Wied., an introduced species first found there in 1925, *C. nigriceps* [i.e., *atriceps*, Edw.], which has been found nowhere else but in Tahiti, *Aedes* (*Sigomyia*) *argenteus*, Poir., a recently introduced species, which is not generally distributed in Tahiti, but has been found also in two other islands of the group, and *A. (S.) variegatus*, Dol. [var. *pseudoscutellaris*, Theo.], which is indigenous and breeds in small natural collections of water, tree-holes, coconut husks, etc. No Anopheline has yet been found in the Society Islands, and none is known to occur nearer than the New Hebrides, where *Anopheles* [*punctulatus*, Dön.] breeds freely in the taro swamps; there is a danger of this species being introduced by shipping, some of which comes direct from the New Hebrides to Tahiti, in which case it would find suitable breeding grounds where taro is grown, and a malaria epidemic might follow.

PAPERS NOTICED BY TITLE ONLY.

- SHEARD (C.) & HARDENBERGH (J. G.). **The Effects of Ultraviolet and Infra-red Irradiation on *Demodex folliculorum*.**—*J. Parasit.*, xiv, no. 1, pp. 36-42, 1 pl., 5 refs. Urbana, Ill., September 1927.
- JORDAN (K.). **Siphonaptera collected in the Dolomites.**—*Nov. zool.*, xxxiv, no. 2, pp. 173-177, 6 figs. Tring, 29th February 1927.
- JORDAN (K.). **Siphonaptera collected during a Visit to the Eastern United States of North America in 1927.**—*Nov. zool.*, xxxiv, no. 2, pp. 178-188, 4 figs. Tring, 29th February 1927.
- WAGNER (J.). **Beiträge zur Kenntniss der Aphanipteren-Fauna Jakutiens.** [Contribution to the Knowledge of the Siphonaptera of Yakutsk.] [*In German and Russian.*]—*Matér. Commiss. Etude Républ. A.S.S. Iakoute*, pt. 16, iv+12 pp., 4 figs. Leningrad, Acad. Sci., 1927. Price 50 k.
- NICOLLE (C.), ANDERSON (C.) & COLAS-BELCOUR (J.). **Note préliminaire sur un nouveau spirochète sanguicole pathogène (*Sp. normandi*) transmis par un ornithodore (*Orn. normandi*), hôte des terriers de rongeurs nord-africains.**—*Arch. Inst. Pasteur Tunis*, xvi, no. 3, pp. 219-221. Tunis, September 1927. [See *R.A.E.*, B, xvi, 2.]
- NICOLLE (C.) & ANDERSON (C.). **Note préliminaire sur la transmission du spirochète de la musaraigne par *Ornithodoros moubata* et sur le mécanisme de la transmission des spirochètes récurrents par les tiques. Note préliminaire sur la transmission expérimentale du spirochète de la récurrente espagnole par l'*Ornithodoros moubata* et mécanisme de cette transmission.**—*Arch. Inst. Pasteur Tunis*, xvi, no. 3, pp. 222-224, 225-227. Tunis, September 1927. [See *R.A.E.*, B, xvi, 3.]
- EDWARDS (F. W.). **Two new *Simulium* from Kashmir.**—*Bull. Ent. Res.*, xviii, pt. 2, pp. 169-170. London, December 1927.
- VAN SACEGHEM (R.). **Les glossines (tsé-tsé) ne sont pas les seules mouches qui propagent les trypanosomiasés animales (maladie du sommeil).**—*Agric. Elevage Congo belge*, i, no. 22, pp. 256-258, 3 figs. Brussels, 17th December 1927. [See *R.A.E.*, B, xi, 88.]
- [PAVLOVSKIÏ (E. N.) & STEIN (A. K.).] Павловский (Е. Н.) и Штейн (А. К.). **Experimental Observations on the Action of *Ixodes ricinus* on the Skin of Man.** [*In Russian.*]—*Russ. J. Trop. Med.*, 1926, no. 8, pp. 3-10, 1 fig., 1 ref. Moscow, 1926. (With a Summary in German.) [See *R.A.E.*, B, xvi, 46.] [Reed. 1928.]
- [BLAZHINA (A. N.).] Блажина (А. Н.). **The Determination of the Type of Blood in the Mosquito by means of the Uhlenhuth Reaction.** [*In Russian.*]—*Russ. J. Trop. Med.*, 1926, no. 8, pp. 11-14. Moscow, 1926. [Reed. 1928.]
- [POPOV (P. P.) & MANUILOVA (N. S.).] Попов (П. П.) и Мануйлова (Н. С.). **A new Microsporidian [*Cocconema pediculis-vestimenti*] found in *Pediculus humanus* L. (*vestimenti*, Nitzsch).** [*In Russian.*]—*Russ. J. Trop. Med.*, 1926, no. 8, pp. 43-49, 5 figs., 14 refs. Moscow, 1926. (With a Summary in English.) [Reed. 1928.]

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- [PAVLOVSKIĬ (E. N.) & STEIN (A. K.).] Павловский (Е. Н.) и Штейн (А. К.). **Pathological Changes in the Skin of Man under the Influence of the Body Juices of *Paederus fuscipes*.** [In Russian.]—*Russ. J. Trop. Med.*, 1926, no. 9–10, pp. 13–15. Moscow, 1926. [Recd. 1928.]
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- [SMORODINTZEV (I. A.) & ADOVA (A. N.).] Смородинцев (И. А.) и Адова (А. Н.). **Comparative Determination of Oxide in Turf Water by the Kubel and Shultz Method.** [In Russian.]—*Russ. J. Trop. Med.*, v, no. 1, pp. 16–18, 2 refs. Moscow, 1927.
- [ZUĬTIN (A. I.).] Зуйтин (А. И.). **Variation in Mosquitos. II. Variability of the Malaria Mosquito, *Anopheles maculipennis*, Meig. Comparison in Variation of *Anopheles* and *Culex*.** [In Russian.]—*Trav. Inst. Sci. nat. Peterhof*, no. 3, pp. 76–98, 16 refs. Leningrad, 1926. (With a Summary in German.) [Recd. Dec. 1927.]
- GALLIARD (H.). **Note sur les larves de *Culex hortensis* Ficalbi et *Culex apicalis* Adams.**—*Bull. Soc. Path. exotique*, xx, no. 7, pp. 609–613, 1 fig., 4 refs. Paris, 1927.
- ROSS (Sir R.). **Malaria-control in Ceylon Plantations.**—14 pp. [London, Ross Inst. & Hosp. Trop. Med., 1926.] [See *R.A.E.*, B, xiv, 128.]
- ROOT (F. M.). **Studies on Brazilian Mosquitoes. iii. The Genus *Culex*.**—*Amer. J. Hyg.*, vii, no. 5, pp. 574–598, 6 pls., 8 refs. Baltimore, Md., September 1927.
- PINTO (C.). **Classificação dos generos de Hemipteros da familia Triatomidae (Reduviidoidea).**—*Rev. Med.*, xii, no. 48, pp. 271–281, 13 figs. S. Paulo, 1927. [See *R.A.E.*, B, xv, 235.]
- BACIGALUPO (J.). ***Periplaneta americana*, hôte intermédiaire du *Gigantorhynchus morbiliformis* Bremsen, dans la République Argentine.**—*C.R. Soc. Biol.*, xcvi, no. 29, p. 1251, 2 refs. Paris, 4th November 1927.
- ROSENBUSCH (F.). **Evolución del piroplasma bigeminum en la garrapata (*Boophilus microplus* Can. Lah.).** [Development of *Piroplasma bigeminum* in the tick *B. annulatus microplus* in Argentina.]—*Rev. Univ. Buenos Aires*, (2) xxiv, pp. 863–867, 9 pls. Buenos Aires, September 1927.
- PATERSON (G. C.), SHANNON (R. C.) & DEL PONTE (E.). **Observaciones sobre la distribución de los flebotomos de las provincias del noroeste de la República Argentina.** [Observations on the Distribution of *Phlebotomus* in the Provinces of North-west Argentina.]—*Rev. Univ. Buenos Aires*, (2) xxiv, pp. 1267–1272. Buenos Aires, September 1927. [Cf. *R.A.E.*, B, xvi, 13.]

RUSSELL (H.). **Notes on the Reaction of the Breeding-places of Anophelines in Macedonia.**—*Bull. Ent. Res.*, xviii, pt. 2, pp. 155–158, 1 table, 1 map, 13 refs. London, December 1927.

The results of previous work on the relation of hydrogen-ion concentration to the breeding of mosquitos are briefly reviewed. During the summer of 1926 observations were made on the breeding-places of the common Anophelines of the Salonika and Langada sections of Macedonia, where the geological formation is such that a study of the reaction of the natural water is likely to be of unusual interest to the student of mosquito ecology and the malaria engineer. The technique employed is described, the most simple being all that is required for such investigations. Only natural breeding-places were observed, but Anopheline larvae were found once in an artificial collection of rain-water, which registered pH 9, and some were also present in open cement tanks and in a shallow well, but these were neglected and full of vegetation and so resembled natural pools. At no time were Anopheline larvae found in water of alkalinity above pH 9.5 or below pH 8. Culicine larvae were found from about pH 10 to pH 6.5 and were almost always present with Anophelines in their natural breeding-places. Whether the factor in water that attracts Anophelines is floral, faunal or chemical, the pH reading is sufficiently often an index of its presence and so of Anopheline larvae, in the district under consideration, to be of definite value to the anti-malarial worker. The Anophelines observed were *Anopheles bifurcatus*, L., *A. superpictus*, Grassi, and *A. maculipennis*, Mg., and the breeding-places in which each was found are indicated.

EVANS (A. M.). **A short illustrated Guide to the Anophelines of Tropical and South Africa.**—*Mem. Liverpool Sch. Trop. Med.*, n.s., no. 3, imp. 8vo, 78 pp., 12 pls., 10 figs., 3 pp. refs. Liverpool Univ. Press; London, Hodder & Stoughton, Ltd., October 1927. Price 7s. 6d. paper, 9s. 6d. cloth.

This is a useful account of the Anophelines of the Ethiopian Region, with keys to the adults of all the species (in some cases applicable to the females only) and the larvae of six species, and original drawings, mainly illustrating characters used in the keys. The distribution of each species is indicated, the adults and in most cases the larvae are described, and notes are given on the bionomics. The classification and, with very few exceptions, the synonymy of Christophers [*R.A.E.*, B, xiii, 109] are followed. Diagnoses of the varieties of *Anopheles mauritanus*, Grp., by F. W. Edwards, are published in an appendix.

JORDAN (D. S.). **The Mosquito Fish (*Gambusia*) and its Relation to Malaria.**—*Rep. Smithsonian Instn.*, 1926, pp. 361–368, 4 pls. Washington, D.C., 1927.

The author advocates the introduction of *Gambusia* into countries infested with mosquitos. *G. patruelis* and *G. holbrooki* devour eggs, larvae and adult mosquitos in enormous numbers. They are prolific breeders, are easily transported and are capable of withstanding a large range of temperature. They have been found to survive in a pond covered with 1½ ft. of ice in Illinois, and have been observed in water at 102° F. In establishing the fish in a new region, it is advisable

to prepare a pond, not more than 4 ft. deep, with a lining of concrete. Copper sulphate, sometimes used to clear the water in ponds, is fatal to *Gambusia*, and the large water beetle, *Dytiscus* sp., is very destructive to it.

PETRAGNANI (G.) & CASTELLI (A.). **Le gambusie nella lotta antilarvale in provincia di Cagliari (con particolare riguardo alla biologia).** [Larval Control by Means of *Gambusia* in the Province of Cagliari, with special Notice of the Biology of this Fish.]—*Riv. Malariologia*, vi, no. 4-5, pp. 709-727. Rome, July-October 1927. (With Summaries in Italian, p. 875, French, p. 876, English, p. 878.)

Gambusia holbrooki, which was imported some years ago, is now established in Sardinia. It can live in water with a salt-content of 20-25 per mille as well as in fresh water, and can live in waters too rich in decomposing organic matter for other fish, a fact that renders it useful against *Culex* spp. It is extremely prolific, but where suitable food is lacking, the young fish are eaten by the adults. At temperatures of 20-30° C [68-86° F.] it lived without food for over three weeks. It is advisable to stock the salt-water pools communicating with canals and ditches, even if their salinity precludes the occurrence of mosquito larvae, because in the dry season, when the canals and ditches dry up, the pools themselves remain as a nursery for the fish, which can regain the canals when they are again filled. Each fish can keep a water-surface of 11 sq. ft. free from larvae.

SEPULCRI (P.). **Rapporti tra anofelismo ed ambiente nella zona litoranea tra Piave e Livenza.** [The Relations between Anophelism and Environment in the coastal Zone between the Piave and Livenza Rivers.]—*Riv. Malariologia*, vi, no. 4-5, pp. 728-750, 1 map. Rome, July-October 1927. (With Summaries in Italian, p. 875, French, p. 877, English, p. 879.)

Though malaria increased in the years following the War, the reclamation and cultivation of the land in the Venetian coastal zone between the Piave and Livenza rivers has now resulted in many districts in the phenomenon of the occurrence of Anophelines without malaria. This state is one of unstable equilibrium. The protection afforded by domestic animals appears to act merely by diminishing the contacts between man and mosquito, without having any other effect on the potential transmission of malaria. Besides the common *Anopheles maculipennis*, Mg., there also occur in this region *A. algeriensis*, Theo., and *A. sacharovi*, Favr (*elutus*, Edw.), which were not, however, recorded prior to 1925. *A. algeriensis* is scarce and very rarely found in dwellings. Both this species and *A. sacharovi* are most numerous in an area that contains many sheets of water into which salt-water flows at high tide. Larvae abound in these waters, and adults are plentiful in animal quarters. At greater distances from the coast *A. sacharovi*, which may have been introduced in ships, becomes scarcer. The lack of floats on the eggs of this species may be an adaptation resulting from the fact that they are not required in dense liquids.

FALLERONI (D.). **Discussione sulla zooprofilassi e sulla biologia degli anofeli italiani.** [A Discussion on Zooprophyllaxis and on the Biology of Italian *Anopheles*.]—*Riv. Malariologia*, vi, no. 4-5, pp. 751-776. Rome, July-October 1927. (With Summaries in Italian, p. 876, French, p. 878, English, p. 879.)

This is largely a discussion of papers already noticed [*R.A.E.*, B, xv, 181-182].

Regarding the report by Pecori & Escalar, it is pointed out that as most of the anti-larval work near Rome was done in February and March, it can only have affected *Anopheles bifurcatus*, L., a species of little epidemiological importance, and not *A. maculipennis*, Mg. Furthermore, the reduction in primary infections is insufficient to indicate a decrease in malaria, because the latter was already widespread in the previous year, so that the opportunity for primary cases was diminished.

Dealing with Ottolenghi's paper the author again points out that the protection afforded by domestic animals can be successful only if certain conditions are complied with [*R.A.E.*, B, xv, 183]. He does not agree with the view of Missiroli and Hackett that races of *A. maculipennis* that definitely prefer to feed on animals have arisen in Italy, and states that he has visited a locality where every condition has favoured the formation of a zootrophic race, but where the mosquito exhibits no reluctance to bite man.

[IVANCHENKO] Иванченко (—). **Artesian Water Supply in the Northern Caucasus and the Part it plays in determining the Extent of Migration of winged *Anopheles maculipennis*, Mg.** [In Russian.]—*Russ. J. Trop. Med.*, 1926, no. 8, pp. 31-36. Moscow, 1926. [Recd. 1928.]

The author discusses the artificial water supply, including artesian wells, in various localities in the northern Caucasus, as a result of which these areas have become populated and are subject to infestation by mosquitos and malaria infection. Such areas are peculiarly suitable for studying the range of flight of *Anopheles maculipennis*, Mg., from its breeding-places.

[SHCHERBAKOV (S. G.).] Щербанов (С. Г.). **Biological Observations on *Anopheles claviger* in 1924 in Minsk.** [In Russian.]—*Russ. J. Trop. Med.*, 1926, no. 8, pp. 37-38. Moscow, 1926. [Recd. 1928.]

These field notes on the seasonal history of *Anopheles maculipennis*, Mg. (*claviger*, auct.) in Minsk indicate the occurrence of three generations during 1924, though four might be expected in warmer seasons.

[VOSKRESSENSKIĖ] WOSKRESSENSKI (B.) & BRENN (H.). **Das Trockenlegen der Reisfelder für kurze Zeit als prophylaktisches Mittel im Kampf gegen die Malaria in Aserbeidshan.** [The Drying of Rice-fields for a short Time as a prophylactic Measure in Work against Malaria in Azerbaijan.]—*Arch. Schiffss. u. Tropenhyg.*, xxxii, no. 1, pp. 37-40. Leipzig, January 1928.

The flooded condition of rice-fields in Azerbaijan from May to September is a factor in the occurrence of malaria there. At Chanlich

Anopheles maculipennis and *A. pseudopictus* occur in rice-fields, flooded lowlands, pools along canals and rain-puddles, and together with *A. bifurcatus* in pools, springs and the water at the bottom of abandoned drainage ditches. *A. superpictus* is found in the delta pools of small brooks. Experiments from June to October showed that Anopheline larvae are destroyed by draining the field dry for three days every fifteen days. This kills the larvae of *Aedes* also, and does not injure the rice.

[KHODUKIN (N. I.).] Ходукин (Н. И.). On the Biology of Hibernating *Anopheles* and its Importance in the Epidemiology and Control of Malaria in Turkestan.—*Russ. J. Trop. Med.*, v, no. 8, pp. 502-512, 9 refs. Moscow, 1927. (With a Summary in French, p. 534.)

Anopheles sacharovi, Favr, is the chief mosquito near Tashkent. Its main breeding-places are in the rice-fields near the town, and there appears to be a distinct migration of this mosquito from them in the autumn in search of suitable hibernating quarters in the town and a return to the breeding ground in the spring. This species, and also *A. hyrcanus*, Pall., and *A. hyrcanus* var. *mesopotomiae*, Christ., hibernate in the adult stage, the last two almost exclusively among reeds and other plants. Other Anophelines occurring in the region are *A. bifurcatus*, L., and *A. pulcherrimus*, Theo., which hibernate in the larval stage, and *A. superpictus*, Grassi, which, according to Latushev, also occasionally hibernates as a larva. *A. bifurcatus* and *A. pulcherrimus*, even under laboratory conditions, do not usually pupate until the spring. The eggs from which the hibernating larvae of *A. bifurcatus* hatch are usually laid up to the middle of November; the larvae hatching before this do not usually survive, though they may complete their development if the weather is warm enough. The same also occurs in the case of *A. pulcherrimus*, except that the hibernating larvae appear slightly earlier. It is suggested that in such larvae, as in hibernating adults, some definite change in the organism occurs that is in some way connected with other factors besides a reduction of temperature.

The possibility of winter infection through the bites of hibernating mosquitos has been considered. Individuals of *A. sacharovi* and *A. hyrcanus*, when brought into the laboratory, do not feed in winter until the middle of February; these individuals have fully formed fat-bodies, whereas those containing a blood-meal do not show any development of the fat-body and are probably surviving adults of the pre-hibernating generation. The deposition of fat is considered to be one of the main characteristics of the hibernating generation.

The development of the malarial parasite in mosquitos during the winter is not considered probable under local conditions, and it has not yet been discovered whether it would have time to complete its development in the mosquito in the short period of activity of the latter between hibernation and death in spring. The problem of spring infections, therefore, requires further study.

The remedial measures adopted are mainly limited to the destruction of larvae, as owing to the peculiarity of local dwellings, etc., fumigation against the hibernating adults is not practicable.

[SHAKHOV (S. D.).] **Шахов (С. Д.).** *Agamomermis*, Stiles, parasitic on *Aedes dorsalis*, Mg., and *A. cantans*, Mg., near Kharkov. [In Russian.]—*Rev. russe Ent.*, xxi, no. 1-2, pp. 27-32, 3 figs., 7 refs. Leningrad, 1927.

Adults of *Aedes dorsalis*, Mg., and *A. maculatus*, Mg. (*cantans*, Mg.) in the vicinity of Kharkov were heavily infested by a Mermithid (*Agamomermis*). Though as many as 83 per cent. were parasitised, in no case was *Culex pipiens*, L., or *Anopheles maculipennis*, Mg., found to be infested. Infestation is probably acquired in the larval stage by swallowing the eggs or even the small larvae of the parasite. No eggs were laid by infested individuals.

[SHTAKEL'BERG (A. A.).] **Штакельберг (А. А.).** *Culicidae of U.S.S.R. and Adjoining Countries*. [In Russian.]—*Tab. anal. Faune U.S.S.R. Mus. zool. Acad. Sci.*, 1, vi+169 pp., 83 figs., numerous refs. Leningrad, 1927. Price Rbl. 2.

The general morphology of the various stages of mosquitos is described, and instructions are given for collecting, mounting and preserving specimens. Keys are given to the species of the various genera. Though the keys and descriptive notes include both adults and larvae, the former are dealt with at greater length, and it is hoped to deal more fully with the larvae in a special paper.

[BELITZER (A. V.).] **Белицер (А. В.).** *The Biology of Dermacentor reticulatus, F., in Connection with the Part it plays as a Vector of Piroplasmosis of Horses*. [In Russian.]—*Russ. J. Trop. Med.*, v, no. 1, pp. 50-55. Moscow, 1927.

The biology of *Dermacentor reticulatus*, F., is described from observations made in Ryazan during 1924 and 1925 and in the laboratory [R.A.E., B, ii, 98; xiii, 53]. The ticks that attack horses in the autumn are all small individuals, and it is thought that they have probably been derived from insufficiently fed nymphs.

[LINDTROP (G. T.).] **Линдтроп (Г. Т.).** *The Distribution of Anopheles plumbeus, Steph., in the Caucasus and the Question of its Occurrence in other than the usual Breeding-places (Tree-holes)*. [In Russian.]—*Russ. J. Trop. Med.*, v, no. 1, pp. 56-60, 9 refs. Moscow, 1927. (With a Summary in German, p. 70.)

A list is given of the 11 species of Anophelines occurring in the Caucasus, and the distribution of *A. plumbeus*, Steph., in that region is discussed. Although various breeding-places have been recorded for this species, the author has never found it except in tree-holes. No other Anopheline was found in tree-holes.

NINO (F. L.). **Schizotrypanosis experimental en el gato**. [Experimental Trypanosomiasis in the Cat.]—*Rev. Univ. Buenos Aires*, (2) xxiv, pp. 888-898, 1 pl., 7 figs., 14 refs. Buenos Aires, September 1927.

An account is given of the experimental infection of a cat in North Argentina by inoculating the flagellate forms of *Trypanosoma cruzi* obtained from the intestinal contents of the Reduviid, *Triatoma infestans*, Klug.

GAMINARA (A.). **Notas sobre triatomas uruguayas.** [Observations on the Species of *Triatoma* in Uruguay.]—*Rev. Univ. Buenos Aires*, (2) xxiv, pp. 1260–1266, 5 figs. Buenos Aires, September 1927.

The Reduviids common in Uruguay are *Triatoma infestans*, Klug, and *T. rubrovaria*, Blanch.; *T. sordida*, Stål, and *T. circummaculata*, Stål, are very much less abundant. *T. infestans* is usually the only Reduviid found on man and domestic animals and living indoors. *T. rubrovaria* is found only exceptionally in dwellings; it normally attacks wild mammals, birds and lizards. *Trypanosoma cruzi* is not found in *T. infestans* in dwellings in Uruguay, whereas it occurs in all stages in *T. rubrovaria*.

LAHILLE (F.). **Nota sobre algunos acaros del pais.** [Note on some Mites and Ticks of North Argentina.]—*Rev. Univ. Buenos Aires*, (2) xxiv, pp. 1286–1304, 8 pls., 5 figs. Buenos Aires, September 1927.

The mites recorded include *Microtrombidium brumpti*, sp. n., attacking man. The ticks, *Amblyomma cajennense*, F., *A. ovale*, Koch, and *A. americanum*, L., also attack man; the first is far the most common and is a possible vector of bovine piroplasmosis. It attacks various wild and domestic animals, and may even be found on toads. *Ornithodoros megnini*, Dugès, common on horses, mules, etc., and *Argas persicus*, Oken, which transmits spirochaetosis of fowls, sometimes attack man.

Descriptions are given of the various mites and ticks discussed.

DAVIS (N. C.), LAINO (F.) & LOBO (M. M.). **Consideraciones sobre la lucha anti-palúdica dirigida contra los anofeles adultos.** [Notes on Anti-malarial Work against adult Mosquitos.]—*Rev. Univ. Buenos Aires*, (2) xxiv, pp. 1027–1034, 3 figs., 8 refs. Buenos Aires, September 1927.

This paper is a further survey [*R.A.E.*, B, xiv, 113] of general work against adult mosquitos. The authors conclude that systematic destruction of adults in dwellings may be of some value as a supplementary measure against malaria.

DAVIS (N. C.), CABARROU (F. C.) & LAINO (F.). **Estudios entomologicos en su relación con la lucha antipalúdica.** [Entomological Studies as a Basis for Anti-malarial Work.]—*Rev. Univ. Buenos Aires*, (2) xxiv, pp. 1249–1259, 3 refs. Buenos Aires, September 1927.

An account is given of the results obtained from a mosquito investigation from October 1925 to May 1927 in North Argentina [cf. *R.A.E.*, B, xv, 189]. All the evidence goes to show that *Anopheles pseudo-punctipennis*, Theo., is the chief vector of malaria in the districts studied.

PATERSON (G. C.) & SHANNON (R. C.). **Mosquitos de Embarcación (Salta) con notas sobre la zona biológica del Chaco (Chaco Life Zone).** [Mosquitos of Embarcacion with Notes on the Chaco Life Zone.]—*Rev. Univ. Buenos Aires*, (2) xxiv, pp. 1273–1282, 1 fig. Buenos Aires, September 1927.

Anopheles pseudopunctipennis, Theo., the most important vector of malaria in the northern provinces of Argentina [*R.A.E.*, B, xv, 189] was recorded from Salta in 1924 [xiv, 178]. In May 1926 the authors found very few mosquitos in this district, owing to the dryness of the preceding season, and *A. pseudopunctipennis* was not observed. It was found again, however, at the end of April 1927, when mosquitos of various genera were numerous.

A key is given to the mosquitos recorded, new species including *A. davis*, sp. n.

SHANNON (R. C.). **Contribución a los estudios de las zonas biológicas de la República Argentina.** [A Contribution to the Studies of the Biological Zones in Argentina.]—*Rev. Soc. ent. Argent.*, ii, no. 4, pp. 1–14, 1 map. Buenos Aires, 1st November 1927.

This paper deals with the distribution of various groups of Diptera in Argentina and discusses certain regions there that appear to represent different biological zones. The genus *Anopheles* occurs only in the northern half of Argentina, i.e., north of a line drawn through the towns of San Juan, Córdoba and La Plata. *A. albitarsis*, Arrib., *A. argyritarsis*, R.-D., and *A. tarsimaculatus*, Goeldi, occur throughout most of this territory, but other species are more localised, there being three ecological zones. The north-west, which is semi-arid, elevated, and partly mountainous, may be called the zone of *A. pseudopunctipennis*, Theo., while *A. albitarsis*, *A. argyritarsis*, *A. tarsimaculatus*, *A. tarsimaculatus* var. *rondoni*, Neiva, and *A. davis*, Paterson & Shannon, also occur there. The central zone is low-lying and semi-arid with scanty forests and lies between the foot-hills of the Andes and the Parana and Paraguay rivers. Very little is known of its Anopheline fauna, though *A. albitarsis* and *A. pseudopunctipennis* have been found there. The eastern zone includes the valleys of the Parana and Paraguay, the region eastward from these rivers, and the northern half of the province of Buenos Aires. There are heavy rains and large forests in this zone. While the three widely-distributed species, *A. albitarsis*, *A. argyritarsis* and *A. tarsimaculatus* occur, the fauna differs markedly from that of the north-west. *A. pseudopunctipennis*, *A. tarsimaculatus* var. *rondoni* and *A. davis* are absent, while *A. bachmanni*, Petrochi, *A. annulipalpis*, Arrib., *A. pseudomaculipes*, Chagas, and *A. mediopunctatus*, Theo., occur. Green algae are favourable to the larvae of *A. pseudopunctipennis*, and its distribution coincides with that of these plants. Large forests and dense, low vegetation encourage the species of the *Arribalzagia* group and are avoided by those of the *Nyssorhynchus* group. Masses of floating aquatic plants (*Azolla*, *Salvinia*, *Pistia*) favour *A. bachmanni*, *A. albitarsis* and *A. tarsimaculatus*. *A. argyritarsis* prefers streams of fresh water; *A. albitarsis* occurs in comparatively polluted water.

NIÑO (F.L.). **Breves noticias sobre el *Triatoma infestans* en la República Argentina.** [Short Notes on *T. infestans* in Argentina.]—*Rev. Soc. ent. Argent.*, ii, no. 4, pp. 55–64, 2 pls., 2 figs., 1 ref. Buenos Aires, 1st November 1927.

The Reduviid, *Triatoma infestans*, is widely distributed in Argentina. An adult engorges in 5–10 minutes. A female lays from 1 to 24 eggs at a time, with a total of about 100. The optimum temperature for incubation is between 25 and 30° C. [77–86° F.]; at 20° C. [68° F.] about 20 days are required. The larvae can fast for as long as six months, in which case they do not moult. *T. infestans* can live about a year, and reproduction occurs once during that period. The larva and adult are described.

CARR (E. C.). **Flies and their Eradication.**—*U.S. Nav. Med. Bull.*, xxv, no. 3, pp. 528–542, 1 pl., 11 figs., 11 refs. Washington, D.C., July 1927.

An account is given of the measures carried out for the control of flies at the naval hospital at Great Lakes, Illinois. Elaborate precautions were taken to prevent the breeding of flies in garbage and rubbish; all garbage was incinerated daily, and rubbish dumps that could not be removed were treated by covering the surface with lime or cinders and by spraying once a week with a solution of 3 per cent. bone oil in coal-tar creosote oil containing at least 14 per cent. tar acids and 3 per cent. bases, this solution being both a larvicide and a repellent. Stables, etc., were screened and sprayed twice a week with the repellent solution, and manure was removed and incinerated daily. If the manure is required for agricultural purposes it can be treated with coal-tar creosote solution [*R.A.E.*, B, vi, 26], or with borax at the rate of 1 oz. to 1 cu. ft.; it is preferable either to apply the borax in solution or to water the manure heap after the borax has been dusted over it. Borax is said to kill 90 per cent. of the fly larvae, and is not injurious to crops if used on land at a rate of less than 15 tons to the acre.

To supplement the measures against fly-breeding, various methods of destroying adult flies were employed. Several types of fly-trap are described or figured, including one consisting of a frame crossed by rows of parallel wires through which a 500-volt electric current is passed; this frame is placed where flies are known to congregate, or is made an integral part of a screen door, and the flies settling on it are electrocuted. Several liquid poison baits for flies were used, but only to a limited extent, as they are toxic to all animal life; the formulae given are: 4 cc. formaldehyde, 1 gm. sugar and 30 cc. water; 4 cc. formaldehyde, 1.5 cc. aniline, 1 minim bile [and (?) 30 cc. water]; 4 gm. potassium bichromate, 2 gm. sugar and 60 cc. water. The most successful spray used against adult flies consisted of 1 part creosote and 6 parts coal oil distillate, which is the essential composition of a number of proprietary fly sprays. Pyrethrum powder, either in a spray or moulded into small cones and burned, was also used, but only stupefied the flies, so that they had to be collected.

PARROTT (P. J.). **Progress Report on Light Traps for Insect Control.**—12 pp. New York, N.Y., Empire State Gas & Elect. Ass., October 1927.

In experiments in a dairy barn, with traps designed to kill flies by contact with electric current, and equipped in some instances with electric bulbs of different colours, one trap destroyed approximately 100,000 flies in 60 days, a day's catch sometimes exceeding 2,500 individuals. Though records concerning the colour preference of the insects are not conclusive, a clear bulb or a white frosted bulb appeared to attract more flies than red, blue, green or yellow bulbs of the same power, red seeming to attract the least number. Many species of flies occurred in the catches, *Musca domestica*, L., being present in large numbers.

MCDANIEL (E.). **Flies commonly found in Dwellings.**—*Circ. Michigan Agric. Expt. Sta.*, no. 104 bis, 15 pp. East Lansing, Mich., September 1927.

A popular account is given of the flies found in dwellings in Michigan, with notes on their control. The species dealt with are *Musca domestica*, L. (house-fly), *Fannia* (*Homalomyia*) *canicularis*, L. (lesser house-fly), *Muscina stabulans*, Fall. (true stable-fly), *Stomoxys calcitrans*, L. (biting house-fly or false stable-fly), *Pollenia rudis*, F. (cluster-fly), blowflies (*Calliphora vomitoria*, L., *Lucilia caesar*, L., etc.), *Piophilæ casei*, L. (cheese skipper) and *Drosophila* sp.

SMIT (Bernard) & DU PLESSIS (S.). **The Distribution of Blow-flies in South Africa, with special Reference to those Species that attack Sheep.**—*Bull. Dept. Agric. S. Afr.*, no. 13, 19 pp., 2 maps, 2 diagrams. Pretoria, 1927.

This is a much more detailed account of an investigation of which the principal results have been noticed previously [*R.A.E.*, B, xv, 119]. It includes tables showing the seasonal distribution of ten species of flies caught in blow-fly traps in various parts of South Africa; these include, in addition to *Chrysomya chloropyga*, Wied., *C. albiceps*, Wied., and *Lucilia sericata*, Mg., seven species that do not attack sheep, six of which have been recorded elsewhere [*R.A.E.*, B, xiv, 73].

MILLER (D.). **Parasitic Control of Sheep Maggot-flies.**—*N.Z. J. Agric.*, xxxv, no. 4, pp. 219–220, 1 fig. Wellington, 20th October 1927.

Details are given of three further consignments of blow-fly puparia parasitised by *Alysia manducator*, Panz. [*R.A.E.*, B, xv, 85] received from England from the Imperial Bureau of Entomology. Of the parasites thus secured in New Zealand 60 per cent. were females; they were placed in cages containing maggots of *Calliphora erythrocephala*, Mg., *Pollenia* (*C.*) *stygia*, F., *Lucilia sericata*, Mg., and *Chrysomya albiceps*, Wied. (*rufifacies*, Macq.), all of which were readily parasitised. All but the first species injure sheep in New Zealand. Attempts to parasitise *Calliphora icela*, Wlk., have so far failed. A number of generations were reared periodically between January and April, during which period seven liberations were made on maggot infested carcasses and infested offal.

It is certain that *A. manducator* passes the winter successfully in New Zealand, at least in the insectary, where the first spring generation emerged from infested puparia on 20th September. In the field the parasites would be exposed to various factors that might hinder their development; among these is the occurrence of other blow-fly parasites such as *Mormoniella* (*Nasonia*) *vitripennis*, Wlk. (*brevicornis*, Ashm.) and *Phaenocarpa* sp.

MCKENNA (C.). **The Sheep Nasal Fly** (*Oestrus ovis*).—*J. Dept. Agric. S. Aust.*, xxxi, no. 3, pp. 302–303. Adelaide, 15th October 1927.

A brief account is given of the bionomics of *Cephalomyia* (*Oestrus*) *ovis*, L. (sheep nasal fly) and of measures that have been recommended for its control [*R.A.E.*, B, i, 148, ix, 183; xiii, 163]. It does not appear to be so harmful in Australia as in other countries, and its presence is frequently not suspected until the heads of sheep are split open to obtain the brain.

Attempts to cause the expulsion of the bots by fumigations with eucalyptus, burning sulphur or chloroform do more harm than good. Although the method may be successful if the parasites are in the nasal chamber, it will not displace those in the sinuses or the horn cores.

Parasitic Affections.—*Rep. Direct. Agric. Cyprus 1926*, p. 15. Nicosia, 1927.

The following parasites were identified during the year: *Hypoderma crossi*, Patton, and *Cephalomyia ovis*, L., on goats, and *Hyalomma aegyptium*, L., on dogs.

NIESCHULZ (O.). **Ueber mehrfache Infektionen durch *Tabanus rubidus*, Wied.** [On several successive infections by means of *T. rubidus*.] *Centralbl. Bakt.*, Ite Abt., Orig., cv, no. 1–3, pp. 133–136, 6 refs. Jena, 20th December 1927.

In these experiments in Java examples of *Tabanus rubidus*, Wied., taken from buffaloes and kept without food for a day, were placed on horses suffering from surra and transferred almost immediately to healthy horses and guineapigs. In transmission from horse to horse, two horses were infected successively, and from horse to guineapig, three guineapigs were infected successively. In a further experiment with *T. striatus*, F., three guineapigs were infected successively.

DA COSTA LIMA (A.). **Sobre o *Sarcoptes productus* da sarna norueguesa.** [On the *Sarcoptes* producing Norwegian Scabies.]—*Sci. med.*, v, no. 12, pp. 686–690, 5 figs., 10 refs. Rio de Janeiro, December 1927. Also in French in *C. R. Soc. Biol.*, xcvi (1927), no. 36, pp. 1784–1786. Paris, 4th January 1928.

The various opinions on the identity of the *Sarcoptes* producing Norwegian crusted scabies are discussed. Buxton's paper [*R.A.E.*, B, ix, 148] is considered to give the best review of the subject, but the author regards *Sarcoptes scabiei hominis* and *S. scabiei scabiei-crustosae* as distinct, and explains the rarity of Norwegian scabies as being due to the fact that man is infested by a variety of *Sarcoptes scabiei* of which a domestic animal is the usual host.

SUGIMOTO (M.). **Studies on the Parasites of domestic Birds in Formosa.**
[In Japanese.]—*Bull. Dept. Agric. Govt. Res. Inst. Formosa*,
no. 54, pp. 1-26, 6 pls. Taihoku, Formosa, October 1927.

Of the Mallophaga found on pigeons in Formosa, *Esthiopteron columbae*, L. (*Lipeurus baculus*, Nitz.) is the commonest, three other species occurring in smaller numbers. Descriptions are given of all four species, with illustrations.

[GAL'KOV (V. P.).] **Гальков (В.П.) In Support of Hydrocyanic Acid.**
[In Russian.]—*Défense des Plantes*, iv, no. 3, pp. 531-534, 2 refs.
Leningrad, October 1927.

It has been suggested that fumigation with hydrocyanic acid gas should be prohibited in Moscow on the grounds that it is dangerous and not effective against cockroaches. The author quotes details of its application for the fumigation of various types of dwellings in the Uralsk region showing that it kills bed-bugs [*Cimex lectularius*, L.] and cockroaches and is not dangerous if reasonable precautions are observed.

GUYTON (T. L.). **Insect Pests of the Household.**—*Bull. Penn. Dept. Agric.*, Gen. Bull. 432, pp. 13-21, 2 figs. Harrisburg, Pa., 1926.

In the latter part of this popular account, notes are given on the bionomics and control of insects attacking man and animals, including: *Cimex lectularius*, L.; *Ctenocephalus canis*, Curtis, and *C. felis*, Bch. (dog and cat fleas); *Pediculus capitis*, DeG. (head louse); and mosquitos.

KEILIN (D.). **On *Coelomomyces stegomyiae* and *Zografia notonectae*, Fungi parasitic in Insects.**—*Parasitology*, xix, no. 4, pp. 365-367, 4 refs. Cambridge, 19th December 1927.

A comparison of the characters given in the description of *Zografia notonectae*, described from the body cavity of *Notonecta* in Russia in 1922, with those of *Coelomomyces stegomyiae*, described from larvae of *Aedes* (*Stegomyia*) *albopictus*, Skuse (*scutellaris*, Theo.) in Malaya in 1921 [*R.A.E.*, B, ix, 190], shows that these two fungi are congeneric, so that *Zografia* falls as a synonym of *Coelomomyces*. The systematic position of this genus is briefly discussed.

KEILIN (D.). **Fauna of a Horse-chestnut Tree (*Aesculus hippocastanum*). Dipterous Larvae and their Parasites.**—*Parasitology*, xix, no. 4, pp. 368-374, 23 refs. Cambridge, 19th December 1927.

An account is given of the Dipterous larvae inhabiting a sap exudation and a large water-filled cavity in a horse-chestnut tree at Cambridge, and of the parasitic organisms found in them. The species found in the water, which was clear but of a brown colour and had a pH of about 9, included *Anopheles plumbeus*, Steph., *Aedes* (*Finlaya*) *geniculatus*, Ol., and *Orthopodomysia pulchripalpis*, Rond.

OLENEV (N. O.). **On the geographical Distribution in the Palaearctic Region of the Ticks *Dermacentor reticulatus* Fabr. and *D. niveus* Neum. (Ixodoidea).**—*Parasitology*, xix, no. 4, pp. 451–454, 1 map, 1 ref. Cambridge, 19th December 1927.

Localities in which *Dermacentor reticulatus*, F., and *D. niveus*, Neum., have been found in European and Asiatic Russia are listed and shown on a map. The presence in some places of both species and the absence of transition forms confirm their specific distinctness. *D. reticulatus*, hitherto considered to be very widely distributed, is local and rare in the greater part of central Russia, while *D. niveus* is apparently much more widely distributed than was supposed, being found from Eastern Siberia to the Crimea and Bessarabia, and in Turkestan, Persia and Spain.

MCCAMPBELL (S. C.). **Notes on Some Parasites of the Jack Rabbits of Eastern Colorado.**—*Circ. Colo. Ent.*, no. 52, pp. 9–12. Fort Collins, Colo., November 1926.

Of several hundred jack rabbits (*Lepus* spp.) examined during the season none showed symptoms of any specific disease, and it is not thought that tularaemia occurs in Eastern Colorado. The Arthropods found on them were three ticks, including *Dermacentor venustus*, Banks (*andersoni*, Stiles), and *Haemaphysalis leporis-palustris*, Pack., and three species of fleas.

FRANCIS (E.). **Microscopic Changes of Tularaemia in the Tick, *Dermacentor andersoni*, and the Bedbug, *Cimex lectularius*.**—*Publ. Hlth. Rep.*, xlii, no. 45, pp. 2763–2772, 4 pls., 2 figs., 5 refs. Washington, D.C., 11th November 1927.

Recent investigations into the question of tularaemia infection in ticks [*R.A.E.*, B, xii, 123; xiv, 183] have led the author to study the microscopic changes in infected ticks. Uninfected ticks were allowed to feed on infected guineapigs and were dissected after 30 days. The technique is described. Examination and cultures showed that *Dermacentor venustus*, Banks (*andersoni*, Stiles) is a true biological host of tularaemia and harbours the infection not only in its faeces but also in the epithelial cells of its digestive tract and Malpighian tubes and in its coelomic fluid. The absence of demonstrable organisms in the salivary glands and their constant presence in the faeces indicates that transmission is due to the mechanical entrance of faeces through the wound caused by the bite. Guineapigs inoculated subcutaneously with the body fluid of ticks in which *Bacterium tularense* was found always died showing typical lesions of tularaemia, as did those inoculated with dried particles of tick faeces.

There is no record of the transmission of tularaemia to man by the bedbug, *Cimex lectularius*, L., nor is there any indication that bedbugs transmit the infection in nature among animals. Under experimental conditions in the laboratory, bedbugs have transmitted infection from mouse to mouse [*R.A.E.*, B, x, 96]. In the present experiments infection was demonstrated in bedbugs up to the 47th day, when the experiments terminated. The injection of faeces or coelomic fluid from infected bugs into guineapigs caused death with the typical lesions of tularaemia. Serial sections of infected bugs showed multiplication of

organisms in the fresh blood contents of the anterior portion of the mid-gut, heavy infection of the epithelial cells of the posterior portion of the mid-gut, and occasional infection of the Malpighian tubes. Thread forms of the *Rickettsia*-like parasite described in a previous investigation [*R.A.E.*, B, ix, 96] were seen in the majority of bugs in smears of the coelomic fluid taken from the legs and occasionally in sections of cells of the Malpighian tubes; no multiplication of these was obtained on a culture medium.

Seasonal Incidence of Tularaemia and Sources of Infection.—*Publ. Hlth. Rep.*, xlii, no. 48, pp. 2948–2951, 1 pl., 1 map, 1 ref. Washington, D.C., 2nd December 1927.

A map is given showing the States in which tularaemia has occurred in the United States; the nine north-eastern States, Wisconsin and Washington are the only ones in which cases have not been detected. Infection is commonly acquired during the dressing of wild rabbits, through an injury to the hand, and 165 cases acquired in this way have occurred east of the Mississippi River from November to January. The onset of cases traced to the bites of ticks occurs from March to August, the season of the greatest activity of *Dermacentor venustus*, Banks (*andersoni*, Stiles), which has caused 27 cases in Montana and the surrounding States; during these months 17 cases caused by ticks of undetermined species have occurred in Arkansas, Texas, Oklahoma, Louisiana and Tennessee. The onset of 23 cases traced to the bite of flies has occurred from June to September, the period of the greatest activity of *Chrysops discalis*, Will., in Utah and the surrounding States.

YOUNG (C. W.). **Recent Research on the Leishmaniasis outside of China.**—*China Med. J.*, xli, no. 11, pp. 900–909, 44 refs. Shanghai, November 1927.

Recent work on kala-azar, oriental sore and canine leishmaniasis in various parts of the world is reviewed, the author having spent nine months in visiting laboratories and clinics in which investigations on these diseases are being made.

DE BEAUREPAIRE ARAGÃO (H.). **Transmissão da leishmaniose pelos phlebotomos.** [The Transmission of Leishmaniasis by *Phlebotomus* spp.]—*Folha med.*, ix, no. 2, pp. 13–15. Rio de Janeiro, 15th January 1928.

This survey of the investigations throughout the world of the transmission of leishmaniasis, includes reference to the author's discovery that *Phlebotomus intermedius*, Lutz & Neiva, is capable of transmitting *Leishmania brasiliensis* in Brazil [*R.A.E.*, B, x, 159]. The conclusion reached is that sandflies are the probable vectors and that other insects may be disregarded.

Epidemiologia e prophylaxia da peste no Brasil. [Epidemiology and Prophylaxis of Plague in Brazil.]—*Folha med.*, ix, no. 2, pp. 19–20. Rio de Janeiro, 15th January 1928.

One of the papers in this series is an account of plague at Triunfo, Pernambuco. *Mus rattus* is the predominant rodent, and was the most

highly infected. The flea most commonly found on it was *Xenopsylla brasiliensis*, *Pulex irritans* being the most numerous in dwellings. The various methods of fumigation are discussed and the advantages of Zyklon "B" as a method of using hydrocyanic acid gas are emphasised [R.A.E., B, xiv, 173]. At Rio de Janeiro, of 700 fleas from *Mus norvegicus*, which was the most numerous rat, and from *M. rattus* from July to December 1927, *Xenopsylla cheopis* represented 56.28 per cent. and *X. brasiliensis*, 42.28 per cent. The average number of fleas on a rat was 2.4, varying from a maximum of 6 in September to a minimum of 1.2 in July. *X. brasiliensis* predominated in July, August and October, and *X. cheopis* in September, November and December.

THOMANN (H.). **Erfahrungen in der Zucht der Dasselfliege.** [Experiences in Breeding the Warble Fly.]—*Mitt. schweiz. ent. Ges.*, xiv, no. 1 (15th December 1927), pp. 4–5. Berne, 1928.

In order to breed adults of *Hypoderma bovis*, DeG., it is necessary for the larvae to be fully mature; consequently they must have left the warbles naturally. Dry peat must be used, as the larvae will not burrow into it to pupate if it is wet.

HERMS (W. B.). **Tabanids breeding in Rice Fields.**—*Pan-Pacific Ent.*, iv, no. 2, pp. 91–92. San Francisco, Cal., October 1927.

Recent investigations in rice-fields in central California, where dairy cattle have been suffering severely from the large numbers of Tabanids, have revealed an abundance of egg-masses of *Tabanus punctifer*, O.S., adhering to the stems and blades of rice in early August. The eggs, which number from 200 to 300, hatch after an incubation period of about a week. The larvae fall upon the surface of the water or mud, dropping to the bottom as soon as they have broken the surface film. Large numbers of Hymenopterous egg-parasites were reared in the laboratory from egg-masses, from two of which not a single Tabanid larva emerged. *T. punctifer* is predacious and cannibalistic during the larval stage, the length of which is unknown. The larvae leave the water or mud to pupate 4 or 5 inches from the surface of the moist soil at the edge of the rice-field, the adults emerging 6 or 7 days later. Anthrax, which is known to be sometimes transmitted by Tabanids, is common in the district, and cases of anaplasmosis, in the transmission of which their share, if any, is undetermined, have also occurred in several dairy herds. If the present degree of egg-parasitism were largely reduced, a serious infestation of *T. punctifer* would be likely to occur.

KELSER (R. A.). **Transmission of Surra among Animals of the Equine Species.**—*Philipp. J. Sci.*, xxxiv, no. 2, pp. 115–141, 2 pls., 25 refs. Manila, October 1927.

Previous work on the transmission of surra by Arthropods is reviewed; with the possible exception of Cross's experiments with the tick, *Ornithodoros crossi*, Brumpt [R.A.E., B, xi, 116], no definite evidence has been produced of the cyclical development of *Trypanosoma evansi* in an invertebrate host.

An account is given of an outbreak of surra among horses and mules in a military post near Manila in August 1926. This began among animals in the isolation ward and corral of a veterinary hospital, and

with the exception of cases that occurred in units to which infected animals were returned before the discovery of the disease, was confined to them. The isolation ward and corral were close to a river along which *Tabanus striatus*, F., bred and at the edge of an area of bamboo where this fly was abundant, while water-buffalos and oxen, a large percentage of which are carriers of surra in the Philippines, frequented the river and an adjoining road, and a pound for water-buffalos had been constructed not more than 150 yards away from the corral. The horses and mules in the corral were attacked by large numbers of *T. striatus*, which began to appear commonly in the latter part of July and was very abundant by the middle of August, and it was noticed that when one of these flies began to feed, the animal attacked almost invariably became restless and succeeded in making it fly off to another animal; flies thus disturbed in their feeding were seen to bite two or three horses in the space of a minute or two.

During the course of the outbreak eleven examples of *T. striatus* were caught in the vicinity of the isolation corral and immediately given the opportunity to feed on a healthy white rat; five of the flies bit the rat, which developed surra 11 days later. The stomach contents of some of the other six, which were fully engorged when caught, were examined, and numerous trypanosomes morphologically indistinguishable from *Trypanosoma evansi* were found in one. Subsequently eight flies were caught and fed alternately on a guineapig infected with surra and on three healthy white rats, the feeds on each animal being interrupted; two of the rats developed surra after 11 and 12 days respectively. On the following day and up to the eighth day, when the last died, five of the flies were allowed to bite a healthy white rat, without again taking an infective meal; the rat remained healthy for several months and was finally inoculated with blood containing *T. evansi*, when it developed surra and died.

The conclusion drawn from these experiments that infection is spread by *T. striatus* in a purely mechanical manner is confirmed by observations in connection with the outbreak. After the bamboo jungles in the vicinity of the isolation corral had been cleared, the flies invaded other parts of the post and were frequently seen attacking the horses and mules, but as there were no cases of surra among them and water-buffalos had been excluded from the military reservation, the bites were harmless. Had cyclic development of the trypanosome within the fly occurred, the outbreak would not have been terminated so promptly by the removal of infected animals, as there were nearly 900 susceptible animals on the post, and *T. striatus* occurred in fairly large numbers for some months after the outbreak.

Attempts to transmit surra from infected to healthy white rats by means of the bites of *Stomoxys calcitrans*, L., and *Lyperosia exigua*, de Meij., both with interrupted feeds and after intervals of 1-27 and 1-9 days, respectively, were unsuccessful. In a series of experiments with laboratory-bred *Aedes argenteus*, Poir. (*aegypti*, L.) two rats became infected as a result of interrupted feeds on infected rats, but only negative results were obtained when the mosquitos were allowed to feed on a healthy rat over a period of 32 days after feeding for 6 days on an infected one. Although it is probable that mosquitos occasionally transmit surra in nature, it is unlikely that they do so commonly, as they normally complete their feed on an animal without the latter becoming aware of their presence. Negative results were obtained in experiments with *Boophilus annulatus australis*, Fuller, and *Dermacentor*

reticulatus, F., in which the ticks were fed for a short time on dogs infected with surra and then transferred to healthy dogs, on which they were allowed to remain. Negative results were also obtained from the injection into rats of emulsions of eggs laid by ticks that had had an infective feed and of larvae that had hatched from such eggs.

The method employed to determine whether cattle and water buffalos were carriers of *Trypanosoma evansi* is described. Of 141 water-buffalos and 54 cattle, 73 and 12, respectively, proved to be carriers. No carriers were found among equines, in which the disease runs a progressive course terminating in death in a few weeks, and the author considers this a proof that the horse is not a natural host of *T. evansi*. He concludes that the common vector of surra among equines in the Philippines is *Tabanus striatus*, and that the transmission is purely mechanical, but he suggests that transmission to a natural host, possibly water-buffalo, ox or some wild animal, may be effected by an invertebrate in which cyclical development of the trypanosome takes place.

JOYEUX (C.) & KOBOZIEFF (N. I.). **Recherches sur l'*Hymenolepis microstoma* (Dujardin, 1845).**—*Ann. Paras. hum. comp.*, vi, no. 1, pp. 59–79, 7 figs., 30 refs. Paris, 1st January 1928.

A summary of this paper has already been noticed [*R.A.E.*, B, xv, 194]. Mice did not become infested as a result of ingesting the eggs of *Hymenolepis microstoma*, but both rats and mice readily became infested as the result of ingesting the cysticercoids. Cysticercoids of this Cestode were found in 9 out of 16 adults of *Tenebrio obscurus*, F., and 14 out of 30 of *T. molitor*, L., associated with mice in the laboratory, and adults of these two beetles and *Geotrupes stercorosus*, Scriba (*sylvaticus*, Panz.) and larvae of *Ceratophyllus fasciatus*, Bosc, readily became infested when fed on ripe eggs of the Cestode. In no case did larvae of *T. obscurus* or *T. molitor* become infested, nor were they found to be infested naturally. Adults of *G. stercorosus* are unlikely to be eaten by mice on account of their thick integument. This beetle has been found to harbour cysticercoids of at least six species under natural or experimental conditions, including *Choanotaenia infundibulum*, which infests fowls, and *Hymenolepis diminuta*.

The development of the cysticercoid of *H. microstoma* is described; this is the same in all the four insect hosts. The rate of development varies greatly, all stages sometimes occurring at the same time in an insect that has had only one infective feed. The authors consider that it was probably *H. microstoma* that Johnston recorded from fleas in Australia as *H. nana* (*murina*) [*R.A.E.*, B, i, 165].

H. microstoma is widely distributed but apparently rare, in spite of the fact that it infests mice and rats, and the authors conclude that its development must be governed by certain factors at present unknown, although in their experiments infestation of both mammalian and invertebrate hosts was easily effected.

MOUTIER (F.). **Parasitisme occasionnel d'un Diptère *Crataerhina pallida* Latreille sur l'homme.**—*Ann. Paras. hum. comp.*, vi, no. 1, pp. 105–106, 1 fig., 3 refs. Paris, 1st January 1928.

The author records a case in which a woman was bitten on the nape of the neck by the Hippoboscid, *Crataerhina pallida*, Latr., two adults

of which were found in her hair. Swallows' nests in which some of the flies were still living were found to have fallen down the chimney of the room in which she slept.

NEVEU-LEMAIRE (M.). **Essai de mammalogie médicale. II. Les mammifères hôtes intermédiaires ou hôtes définitifs des helminthes parasites de l'homme et ceux qui hébergent des parasites qui leur sont communs avec l'espèce humaine.**—*Ann. Paras. hum. comp.*, v, no. 4, pp. 356–380; & vi, no. 1, pp. 107–131, 25 refs. Paris, 1st October 1927 & 1st January 1928.

This survey, in which the mammals are arranged systematically, includes the Diptera and Arachnida that commonly or occasionally infest both man and other mammals. Alphabetical lists are appended of the mammals, showing the parasites that they harbour, and of the parasites, showing the mammals that harbour them.

SHARP (N. A. D.). **A Note on *Agamofilaria streptocerca* Macfie and Corson, 1922.**—*Ann. Trop. Med. Parasit.*, xxi, no. 4, pp. 415–417, 1 ref. Liverpool, 31st December 1927.

The author records observations showing that *Agamofilaria streptocerca* is not identical with *Onchocerca volvulus*, as has been suggested, either morphologically or in any other respect. Ninety-three examples of *Simulium damnosum*, Theo., were caught at various times feeding on a native in Nigeria in whose skin both *O. volvulus* and *A. streptocerca* were present, in the proportion of one to five. In the stomachs of flies dissected within an hour of feeding *O. volvulus* and *A. streptocerca* were present in the proportion of ten to one, and while the former became increasingly active, the latter became inert; on the third day after feeding, *A. streptocerca* could only occasionally be found in the stomach, no development having taken place, while *O. volvulus* had developed and migrated to the thorax.

NEWSTEAD (R.) & CARTER (H. F.). **Mosquitos on Ships arriving in the Port of Liverpool from West Africa.**—*Ann. Trop. Med. Parasit.*, xxi, no. 4, pp. 419–423. Liverpool, 31st December 1927.

Exhaustive examinations for the presence of mosquitos were carried out between May 1920 and March 1921 on 22 ships arriving at Liverpool from West Africa, some of them having travelled considerable distances inland up the West African rivers. Details of the method of examination are given. No larvae or pupae of mosquitos were found, and adults were found on only one occasion, when three living females of *Culex fatigans*, Wied., were found on a ship that reached Liverpool on 27th September, having left Port Gentil (French Congo) on 23rd August and called at Teneriffe on 16th September. It was stated that a fire had been raging at Port Gentil and large numbers of mosquitos had been blown on board when the ship was about half a mile from the coast; these had continued to be troublesome until within two days of Liverpool, when the weather became cold. Two of the three mosquitos were caught; they could not be induced to bite, but were kept in the laboratory, one dying on 29th October and the other on 27th November.

EVANS (A. M.). **The Discovery of a Specimen of *Anopheles funestus* collected in Mauritius in the Year 1907 or 1908.**—*Ann. Trop. Med. Parasit.*, xxi, no. 4, pp. 425–426, 4 refs. Liverpool, 31st December 1927.

The first worker to record *Anopheles funestus*, Giles, in Mauritius was MacGregor, who found it to be common in 1922 [*R.A.E.*, B, xii, 32]. The author has found a single male of this species in a collection of mosquitos made in Mauritius by Sir Ronald Ross in 1907-08.

DYE (W. H.). **The relative Importance of Man and Beast in Human Trypanosomiasis.**—*Trans. Soc. Trop. Med. Hyg.*, xxi, no. 3, pp. 187–198, 3 maps. London, 25th November 1927. Reprinted in *J. Roy. Army Med. Corps*, l, no. 3, pp. 184–195, 3 maps. London, March 1928.

An account is given of a small local epidemic of sleeping sickness, which began in December 1924, in an area in which the disease is endemic in the south-eastern part of Tanganyika Territory. *Glossina morsitans*, Westw., was abundant, and *G. pallidipes*, Aust., and *G. brevipalpis*, Newst., were occasionally found, the last being limited to a very small area. The distribution of the infection, which was believed to be due to *Trypanosoma rhodesiense*, and the sequence of the occurrence of cases provide evidence strongly in favour of the origin of the outbreak being from man and not from animals. No live-stock other than poultry is kept by the natives, but game is plentiful, and the natives constantly move about the bush. Two villages in which the infection was heaviest, about ten miles apart, were uncleared, and *Glossina* swarmed among the houses, but they had remained uninfected for two and a half years; in a cleared village midway between these only two cases of sleeping sickness occurred, although game and fly were as plentiful in the surrounding bush as in the case of the other villages. All of the inhabitants of one of the heavily infected villages were removed and segregated in a fly-free area, and after two months those that remained well were allowed to return to their village for two and a half months to harvest the crops; none of these developed sleeping sickness during the following twenty months, although the condition of the village had greatly deteriorated and the proximity of game was greater than would normally be the case. It is thus evident that the removal of the human source of infection had rendered the site healthy again. Instances of isolated cases of sleeping sickness in uninfected villages support the view that infection is obtained from man only, each being traced to a visit of the individual to an infected village or to the presence in the village of an infected person.

In November and December 1926 and the early months of 1927, after only a single case had occurred in the area in ten months, a recrudescence of the disease took place, 8 cases occurring in one village and 20 in another; in the first village two individuals who had been treated, relapsed and had parasites in their blood in October 1926, and all the subsequent cases occurred in the immediate vicinity of these. In the other village the cases were all in a restricted area, and two relapsed individuals were known to have died there.

The author concludes that a village badly infested by tsetse-flies can remain healthy for an indefinite period until an infected native arrives, and that the spread of the disease can be controlled by removing the

human source of infection, the failure to eradicate it being due to the difficulty of entirely removing the source of infection from a large area. In the area under consideration the complete destruction or even marked diminution of *Glossina morsilans* would be a matter of great difficulty, if not at present impossible, and it is necessary from a practical point of view to limit measures against it to the neighbourhood of villages and other bush sites used daily by the natives, which would appear to be sufficient for the purpose of controlling sleeping sickness. Main reliance should, however, be placed on constant and rapid removal of the human source of infection. The author suggests that a staff of specially trained native inspectors should be employed in the areas in which sleeping sickness occurs to ensure the immediate discovery of all cases of the disease, which should be segregated for at least 12 and possibly 18 months. In this way it should be possible to eradicate the disease in two or three years.

MANSFIELD-ADERS (W.). **Notes on Malaria and Filariasis in the Zanzibar Protectorate.**—*Trans. Soc. Trop. Med. Hyg.*, xxi, no. 3, pp. 207-214, 1 map. London, 25th November 1927.

The topography and climate of the island of Zanzibar are briefly described. Malaria is endemic, but does not occur in epidemic form, all the adult natives having apparently acquired a considerable active immunity. *Plasmodium falciparum*, *P. vivax* and *P. malariae* are all prevalent, *P. vivax* being the commonest. The Anophelines known to occur in the island are *Anopheles gambiae*, Giles (*costalis*, Theo.), *A. funestus*, Giles, *A. mauritanus*, Grp., *A. maculipalpis*, Giles, *A. squamosus*, Theo., and *A. longipalpis*, Theo., the first two species being the important carriers of malaria, while the last four have seldom been found in houses or engorged with blood. *A. gambiae* breeds by preference in large open swamps, shallows and backwaters of rivers, borrow-pits, or any collection of water well exposed to the sun; larvae have also been found in shallow depressions in coral rocks just above high-water mark, and breeding may also take place in hoof-prints, boats and other receptacles containing water exposed to the sun. Larvae of *A. funestus* are always found in shady areas, generally in shallows at the sides of rivers, seepage water from hills, and at the edges of swamps. Engorged females of *A. gambiae* and *A. funestus* were collected in various localities, mainly in native huts in which children lived, children from one to seven years old being the chief hosts of gametocytes. They were kept in tubes and fed daily on a small portion of date attached to moist filter paper; on the seventh day they were dissected, and the sporozoite infections of the glands were recorded. Over a thousand of each species were examined, and 7.7 per cent. of *A. gambiae* and 7 per cent. of *A. funestus* showed sporozoites.

Filariasis and elephantiasis have been known in Zanzibar for many years, the commonest filarial parasite being *Filaria* (*Microfilaria*) *bancrofti*, although *F. (M.) perstans* has also been recorded. The author found *F. bancrofti* in the blood of 26.3 per cent. of 645 adult natives from different parts of the island, and in the proboscis of 20.3 per cent. of 1,300 engorged female *Culex fatigans*, Wied., captured in houses of various types in different districts and dissected on the twelfth day, after being kept in the same way as the Anophelines. *F. bancrofti* was also found in the thoracic muscles and proboscis of many specimens

of *A. gambiae* and *A. funestus* dissected for malarial parasites. *C. fatigans* is the commonest domestic mosquito in Zanzibar Town, and was found in all villages examined, although rare in some.

BEVAN (LI. E. W.). **A new Method of feeding blood-sucking Flies.**—*Trans. Soc. Trop. Med. Hyg.*, xxi, no. 3, pp. 219–220, 2 figs. London, 25th November 1927.

The apparatus used by the author for feeding *Glossina* or other flies on rabbits consists of two wooden boxes, a lower one sufficiently large to accommodate a rabbit, having two holes in each side through which pass wooden rods, one across the neck and the other across the loins of the rabbit, and a smaller one, measuring about $9\frac{1}{2}$ by $4\frac{1}{2}$ by $4\frac{1}{2}$ inches, with a sliding glass top and an open bottom covered with mosquito netting, which rests on the bars of the other, so that the back of the rabbit, covered with muslin, projects into it. The smaller box has a hole at one side fitted with a large cork, through which flies may be introduced from a tube. As a rule the rabbit will remain quite quiet, and the flies will feed when they feel inclined. An individual fly can be taken from the box by catching it in a test-tube manipulated through a hole in a piece of cardboard large enough to fill the space left by the partial removal of the glass. The wooden sides of the boxes absorb moisture and excreta, and tsetse-flies have been kept alive in them for many weeks.

DUNN (L. H.). **Further Observations on Mosquito Breeding in Tree-holes and Crab-holes.**—*Bull. Ent. Res.*, xviii, pt. 3, pp. 247–250. London, February 1928.

The results are given of observations in Nigeria on the number and species of mosquitos breeding in tree-holes during a period of more than ten months. The two holes selected were a bottle-shaped hole in a dika nut tree, *Irvingia barterii*, and a basin hole in a mango tree, *Mangifera indica*. The species found were *Aedes apicoargenteus*, Theo., *A. argenteus*, Poir. (*aegypti*, L.), *A. apicoannulatus*, Edw., *A. luteocephalus*, Newst., *A. longipalpis*, Grünb., *A. africanus*, Theo., *A. wellmani*, Theo., *A. simulans*, N. & C., *Culex horridus*, Edw. (*Cyathomyia fusca*, Theo.) and *C. nebulosus*, Theo. Of these species 430 were found in the bottle hole, 876 in the basin hole.

The large number of crab-holes in the vicinity of Lagos prompted investigations to find their importance as breeding-places of *A. argenteus*. The species found in 200 crab-holes were *A. irritans*, Theo., 32 per cent., *A. nigricephalus*, Theo., 5.5 per cent., *A. argenteus*, 1.5 per cent., *Culex cinerellus*, Edw., 14 per cent., *C. insignis*, Cart., 13.5 per cent., *C. decens*, Theo., 2 per cent., *C. pruina*, Theo., 1.5 per cent., *C. fatigans*, Wied., 0.5 per cent., *Uranotaenia annulata*, Theo., 23.5 per cent., and *Anopheles gambiae*, Giles, 4 per cent. Of the holes from which larvae were collected, 112 were not more than 100 yards from habitations, the remainder being 200 yards distant. *A. argenteus* was found in three of the holes, demonstrating that, in Nigeria at least, it occasionally breeds in collections of water where at the water's edge there is nothing but mud. This is somewhat at variance with some opinions in regard to breeding-habits of this species in America. Based on these results alone, it is justifiable to believe that crab-holes produce but few adults of *A. argenteus* and have little importance in relation to yellow-fever control.

EDWARDS (F. W.). **Mosquito Notes.**—VII.—*Bull. Ent. Res.*, xviii, pt. 3, pp. 267–284, 4 figs. London, February 1928.

Careful study of the generalisation that the East and West African forms of *Anopheles mauritianus*, Grp., can be distinguished by the amount of white on the hind tibia and first tarsal segment shows this cannot be maintained, but there are 4 varieties which can be easily distinguished and published names can be applied to them. They are *A. mauritianus* type form (=var. *similis*, Theo.), the only form occurring in Madagascar and Mauritius; var. *ziemanni*, Grünb., which may perhaps be used for the commonest West African form; var. *tenebrosus*, Dön., apparently the only form occurring in Egypt; and var. *paludis*, Theo. Descriptions are given of these forms, and their distribution in Africa is recorded. *Anopheles* (*A.*) *symesi*, sp. n., is described from Kenya.

A key is given to 13 larvae of *Lophoceratomyia*, a subgenus of *Culex*, and some of the adults are described, including one new species from Borneo. Among the thirteen other Culicines dealt with, six are described as new.

HEYDON (G. M.). **Report of Investigation into Malaria and Filariasis in Cairns and elsewhere.**—*Health*, v, no. 5, pp. 133–140, 3 refs. Melbourne, September 1927.

Investigations have been carried out in the north of Queensland into the prevalence of filariasis, its incidence there being much lower than in the south of the State. No infection was found in aborigines and others from various parts of North Queensland. Hospital records were too few to indicate whether the disease is increasing or decreasing. There would seem to be no plausible reason for the scarcity of the disease in this particular region, although it is well known that distribution in patches is a characteristic of *Filaria bancrofti*, and investigations made still further north, on the west coast of the Cape York peninsula, revealed a fairly high incidence. The lower density of the population compared with that further south may have some influence, but many carriers of *F. bancrofti* must have been introduced into the sugar areas when kanaka labour was employed there, while *Culex fatigans*, Wied., is present all the year round.

The prevalence of endemic malaria on the north coast of Queensland has also declined greatly, and it may possibly be gradually disappearing. A series of places where it was thought that cases of malaria might be found were visited. Examinations of persons and a study of records showed that although malaria had been quite prevalent in earlier days, there was now scarcely any in the district at all. In a campaign conducted in 1923, however, in the same district 18 out of 554 persons examined in one locality and 3 out of 66 in another had malaria parasites in their blood.

If *Anopheles annulipes*, Wlk., or *A. amictus*, Edw., are suitable vectors of the disease, its decline cannot be attributed to any scarcity of mosquitos; if, however, as has been maintained [*R.A.E.*, B, xi, 150], *A. bancrofti*, Giles, is the main vector, then a decline in the numbers of this mosquito, such as seems to have occurred in some localities, may be a factor. The decline of malaria on the north coast of Queensland, may, however, perhaps be due to such factors as the cessation of any noteworthy immigration of persons containing or likely to develop

gametocytes in their blood, the decrease in numbers of a coloured population living under inferior conditions, and the comparatively high standard of life among the white inhabitants. The introduction of kanaka labour from malarious districts ceased about 1904.

YAMADA (S.). **On a Mosquito-catching Fly.**—*Kontyu*, ii, no. 3, pp. 143–154, 7 pls. Tokyo, November 1927.

The Anthomyiid, *Lispa tentaculata*, DeG. var. *sakhaliensis*, n., is described from Sakhalin. This fly was observed attacking newly-emerged adults of *Culex tipuliformis*, Theo., on the surface of a puddle.

BUTLER (C. S.) & PETERSON (E.). **Malaria in Haiti.**—*U.S. Nav. Med. Bull.*, xxv, no. 2, pp. 278–288, 4 pls., 2 charts, 2 refs. Washington D.C., April 1927.

The incidence of malaria in Haiti is largely governed by rainfall, which varies very greatly in different parts of the Republic. The rainy season extends from May to October, the rainfall curve having two peaks, one usually in May and the other in October. The curve of malaria incidence also has two peaks, in late summer and winter, about two months after those of rainfall. *Anopheles albimanus*, Wied., the only efficient vector of malaria, breeds wherever collections of water occur, up to a height of about 2,500 feet above sea-level.

In some of the larger cities marked progress is being made in eliminating malaria by mosquito control, but in many districts the administration of quinine to infected persons will be the only measure practicable for many years, as small towns and villages are built in the middle of swampy areas. A table is given showing the spleen rate among school children in 28 towns and villages; in 18 the rate was between 10 and 60, and in one 100 per cent.

In the spring of 1924 an Anopheline survey of Port-au-Prince was carried out. *A. albimanus* was found almost all over the city, springs and swamps along the shore being the worst breeding-places. In some springs the larvicidal fish, *Poecilia sphenops* and *Gambusia dominicensis*, occurred, but the mosquito larvae were largely protected from them by luxurious aquatic vegetation. Since 1924 the swamps along the shore within the city boundary have been filled in, cement drains have been built along the streets, and many rock drains, consisting of ditches filled with rocks and covered with earth, have been constructed. Outside the city, swamps have been drained and reclaimed by constructing rock drains and canals, the latter in some cases being lined along the bottom and part of the sides with one-third sections of 3-inch cement pipes. The damming up of water to provide for continuous watering of vegetable crops has been stopped in the vicinity of the city.

The effect of the measures carried out is illustrated by tables showing the monthly incidence of malaria among United States Marines at Port-au-Prince and in the district. The annual rate for men stationed within the city fell from 438 per mille in January 1924 to 0 in January 1926.

BUTLER (C. S.). **Annual Report of the Sanitary Engineer, Republic of Haiti, for the fiscal Year 1925-1926.**—Multigraph, 189 pp., 32 pls. Port-au-Prince, December 1926.

This report includes (pp. 48-61) the paper on malaria and mosquitos noticed above, and also gives details of the mosquito control work, draining, filling, oiling, etc., carried out in the various towns of Haiti during the year under review.

GUELMINO (D.). **Beitrag zum Studium der Biologie der Anophelen in Mazedonien.** [A Contribution to the study of the Biology of Anophelines in Macedonia.]—*Arch. Schiffs- u. Tropenhyg.*, xxxii, no. 2, pp. 87-91. Leipzig, February 1928.

The Anophelines known in the Serbian portion of Macedonia are *Anopheles maculipennis*, Mg., *A. superpictus*, Grassi, *A. bifurcatus*, L., *A. hyrcanus* var. *sinensis*, Wied., *A. plumbeus*, Steph. (*nigripes*, Staeg.), and *A. sacharovi*, Favr. (*elutus*, Edw.). *A. hyrcanus* var. *sinensis* only occurs in certain districts, and *A. plumbeus* and *A. sacharovi* are very rare. *A. maculipennis* begins hibernation at the end of October: it represented 46 per cent. of the hibernating adult Anophelines found, occurring in warm, dark cattle sheds together with *A. superpictus*, and only rarely in places where cattle are not stabled. In uninhabited shelters it remains inactive until March. In cattle quarters it begins to feed in the second half of January and may contain fully mature eggs by the end of the month. Oviposition begins in mid-March, and the first larvae appear at that time. There is a numerous first generation with a maximum in the second half of May and the first half of June. By the end of June, the numbers fall considerably owing to the disappearance of the large marshes and almost total drying of the ground. Although *A. maculipennis* is undoubtedly an important vector of malaria, winter infections are excluded because of its method of hibernation, and in 2,000 specimens dissected in winter no cysts or sporozoites were found. The great increase of tertian malaria in June and July is attributed to new infection connected with the maximum abundance of this mosquito. It must be regarded as the sole carrier of all infections from the end of May to early August.

A. superpictus, which is also a vector from August to the middle of October, represented 54 per cent. of the adults found hibernating. Feeding and maturation of the eggs begins in the first half of February, and oviposition in mid-April. *A. superpictus* disappears rapidly in the second half of May owing to its habit of ovipositing only in brooks and mountain streams, which overflow after every fall of rain and thus carry away and destroy the larvae. In June begins the hot, dry season, which permits the complete development and increase of the species. Its preservation may be ensured by a few larvae that escape being swept away or by the existence of a few hibernated females. *A. superpictus* requires several generations before becoming the predominant species in September. None of the 2,000 females dissected in winter harboured malarial parasites.

A. bifurcatus is widespread. Eggs deposited at the end of October yield larvae that slowly reach the third or fourth instar during November. When the water temperature falls to 10° C. [50° F.], the larvae remain inactive at the bottom of the water. In the second half of February, the water temperature having risen above 50° F., the larvae appear at

the surface and continue development. The first pupae are found at the end of February, and by early April, this winter generation has completed its development. During the summer *A. bifurcatus* is usually rare, and it is negligible as a vector of malaria.

ADOVA [A. N.] & SEBENTZOV [B. M.]. **Biologie et constitution physico-chimique des tourbières et conditions qui y règlent le stationnement des larves d'Anophèles.**—*Bull. Soc. Path. exot.*, xx, no. 8, pp. 811–823, 4 refs. Paris, 1927.

The work in connection with the composition of turf-pits in Russia and their relation to *Anopheles maculipennis*, Mg. [*R.A.E.*, B, xv, 135] was continued and extended during 1926 [xv, 188]. The present paper gives a detailed account of the flora, fauna and chemical composition of recently made turf-pits as well as of those of longer standing.

PAPERS NOTICED BY TITLE ONLY.

JOBLING (B.). **The Structure of the Head and Mouth Parts in *Culicoides pulicaris*, L. (Diptera Nematocera).**—*Bull. Ent. Res.*, xviii, pt. 3, pp. 211–236, 4 pls., 10 figs., 21 refs. London, February 1928.

NITZULESCU (V.). **Contribution à l'étude de la pompe salivaire des Simulidés**—*Bull. Soc. Path. exot.*, xx, no. 8, pp. 748–753, 5 figs., 1 ref. Paris, 1927.

NITZULESCU (V.). **Contribution à l'étude de la pompe salivaire des Tabanidés.**—*Bull. Soc. Path. exot.*, xx, no. 9, pp. 846–851, 4 figs. Paris, 1927.

NITZULESCU (V.). **Contribution à l'étude de la pompe salivaire des Culicidés.**—*Bull. Soc. Path. exot.*, xx, no. 9, pp. 851–857, 6 figs. 4 refs. Paris, 1927.

SINTON (J. A.) & COVELL (G.). **The Relation of the Morphology of the Buccal Cavity to the Classification of Anopheline Mosquitoes.**—*Ind. J. Med. Res.*, xv, no. 2, pp. 301–308, 4 pls., 8 refs. Calcutta, October 1927.

The Anophelines of the Malay Peninsula and Archipelago. Dichotomous Table for Diagnosis of Adult Species.—Fol. 1p. [Singapore, Chief Health Officer, 1927.]

FERRIS (G. F.). **Fifth Report upon Diptera Pupipara from the Philippine Islands.**—*Philipp. J. Sci.*, xxxiv, no. 2, pp. 207–233, 19 figs. Manila, October 1927.

MCATEE (W. L.). **Bird Nests as Insect and Arachnid Hibernacula.**

MALLOCH (J. R.). **Descriptions and Figures of the Puparia of *Minettia ordinaria* and *Calioppe flaviceps* (Diptera).**—*Proc. Ent. Soc. Wash.*, xxix, no. 8, pp. 180–184, 2 figs., 2 refs. Washington, D.C., November 1927.

WARBURTON (C.). **On five new Species of Ticks (Arachnida Ixodoidea), *Ornithodoros nattereri*, *Ixodes theodori*, *Haemaphysalis toxopei*, *Amblyomma robinsoni* and *A. dammermani*, with a Note on the Ornate Nymph of *A. latum*.**—*Parasitology*, xix, no. 4, pp. 405–410, 1 pl., 4 figs., 1 ref. Cambridge, 19th December 1927.

ZOTTA (G.). **Considérations sur l'anophélisme du delta du Danube.**—*Bull. Soc. Path. exot.*, xx, no. 8, pp. 801–811, 1 map. Paris, 1927.

Mosquitos recorded as a result of a survey of the delta of the Danube include *Anopheles maculipennis*, Mg., and *A. (Myzorhynchus) hyrcanus* var. *sinensis*, Wied.

Though *A. maculipennis* is abundant in the vicinity of dwellings, it shows a distinct preference for animals' shelters and apparently rarely bites man. This preference probably accounts for the scarcity of malaria in the delta area. The mosquito also feeds on poultry, and avian blood was found in a considerable percentage of the females examined.

MARCHOUX (E.) & others. **Prophylaxie de la fièvre jaune.**—*Bull. Soc. Path. exot.*, xx, no. 9, pp. 833–838. Paris, 1927.

This report of a commission of the Société de Pathologie exotique outlines the measures necessary for the prevention and control of yellow fever, viz., the isolation of infected persons and the destruction of adults and larvae of *Aedes argenteus*, Poir. (*aegypti*, L.), and makes recommendations regarding the establishment of a sanitary service in the French colonies in West Africa with authority and personnel to carry out these measures. The destruction of the larvae of *A. argenteus* and the examination of ships from countries where yellow fever occurs for the presence of this mosquito should be continued permanently. The report was discussed at a meeting of the Society and was adopted unanimously, and it was decided to present it, together with a resolution, to the French Minister for the Colonies.

RIGOLLET (S.). **A propos de la prophylaxie de la fièvre jaune à la Côte occidentale d'Afrique.**—*Bull. Soc. Path. exot.*, xx, no. 9, pp. 858–865. Paris, 1927.

The author discusses more fully the measures outlined in the preceding paper for the control of yellow fever in West Africa, dealing separately with the bush zone with a purely native population and with the towns, particularly Dakar, with a mixed native and European population. The author believes that yellow fever is always present among the native population in parts of West Africa and that the possibility of eradicating it is extremely slight, as the extermination of the mosquito vector [*Aedes argenteus*, Poir.] and the protection of the natives from its bites are impossible. He suggests, however, that it should be possible to eradicate the disease from particular places where it is endemic by concentrating on the control of *A. argenteus* for a limited period and thus breaking the chain of infection. In the northern part of West Africa and in the interior there is a definite differentiation between the seasons, a wet and hot summer and a dry and cool or cold winter; in the coastal regions to the south of the Gambia the climate is almost uniformly wet and hot. In the former regions the larval development of *A. argenteus* is slower and the adults are inactive at night during the winter; consequently yellow fever is only intermittent, with occasional serious epidemics. In the uniformly hot and wet regions *A. argenteus* is continuously abundant and active, and yellow fever is permanently endemic, although not necessarily ubiquitous.

DOROLLE (P.). **Le paludisme à Hagiang (Tonkin).**—*Bull. Soc. Path. exot.*, xx, no. 9, pp. 895–921, 5 refs. Paris, 1927.

The town of Hagiang, situated on the river Claire in the extreme north of Indo-China, at an altitude of about 600 feet, is extremely malarious. The average spleen rate among native children for 1925–27 was 67·71, and in 1926 79 per cent. of the European population suffered from malaria, while the malaria rate among native troops stationed in the town and inmates of the prison was even higher, and the deaths from malaria amounted to 59 out of 137 medically attested in a total population of about 1,500. Natives of the town acquire tolerance for malaria during childhood, but natives of the surrounding hills and of Annam are extremely susceptible. In 419 positive blood examinations 62 per cent. of the infections were found to be due to *Plasmodium falciparum* (*praecox*), 15 per cent. to *P. malariae* and 13 per cent. to *P. vivax*, the remaining 10 per cent. being mixed.

Mosquitos are scarce in Hagiang, and Anophelines rare; of 350 mosquitos caught by the author in several places in the late afternoon or evening only 10 were Anophelines, and he failed to find a single Anopheline larva in the course of 18 months, although he searched for them in rice-fields, streams, pools, etc. Culicine larvae occurred in many types of breeding-places, including a pot containing gum Arabic and water, from which adults were reared. The author considers that the absence of Anopheline larvae from rice-fields and pools of clear water is due partly to the abundance of natural enemies such as dragonfly larvae and tadpoles, and in some cases to lack of shade. Presumably the Anophelines breed in the thick bush and forest that approach to within a few hundred yards of the town.

There are extremely few domestic animals in or around the town, so that the Anophelines are obliged to bite man and are almost certain to become infective in view of the high malaria rate.

In discussing this paper M. Leger said that in 1910 with a native assistant he caught 601 Anophelines at Hagiang in three evenings in the middle of September; these comprised 13 species including *Anopheles* (*Myzomyia*) *minimus*, Theo. (*christophersi*, Theo.), *A.* (*Myzorhynchus*) *barbirostris*, Wulp, and *A.* (*Nyssorhynchus*) *fuliginosus*, Giles.

CAWSTON (F. G.). **Mosquito-Proof Gutterings.**—*J. Roy. Army Med. Corps*, xlix, no. 6, p. 441. London, December 1927.

Details of suitable roof-gutters for preventing mosquito breeding in the tropics are discussed.

COVELL (G.) & BAILY (J. D.). **Observations on Malaria in the Andamans; with special Reference to the enlarged Spleen in Adults.**—*Ind. J. Med. Res.*, xv, no. 2, pp. 309–326, 4 charts, 11 refs. Calcutta, October 1927.

Malaria is very localised in the Andaman Islands, its distribution depending on that of *Anopheles ludlowi*, Theo., which is the only carrier of any importance [*R.A.E.*, B, xv, 79]. Blood examinations were made of 837 adults and children, and 208 were found to be infected; 59 per cent. were infected with malignant tertian [*Plasmodium falciparum*],

11 per cent. with benign tertian [*P. vivax*] and 35 per cent. with quartan [*P. malariae*], mixed infections occurring in 10 cases. It appears that there must be some hitherto unexplained factor or factors that lead to the relatively high incidence of quartan malaria in the Andamans, this being as marked in acute as in chronic infections, and not therefore due principally to relapses, although it has been shown elsewhere that under experimental conditions *A. ludlowi* is apparently much less susceptible to infection with *P. malariae* than with *P. falciparum* or *P. vivax* [R.A.E., B, vii, 97].

STRICKLAND (C.) & CHOWDHURY (K. L.). **An Anopheline Survey of the Bengal Districts.**—*Ind. J. Med. Res.*, xv, no. 2, pp. 377–426, 11 refs. Calcutta, October 1927.

The results are given of a survey of the Anophelines of the Province of Bengal made between August 1926 and February 1927, in the course of which about 9,000 larvae and 249 adults were examined. Tables are given showing the numbers of larvae and adults of each species taken in each locality and the numbers of larvae of each species taken in each type of breeding-place in each locality, arranged both under species and under type of breeding-place. Definitions of the terms used in recording the breeding-places are given.

The percentage of each species to the total number of larvae collected in the whole Province is shown in a table and compared with the results obtained in a survey made by the authors in the tea gardens of the Duars, in the extreme north of the Province, from April to July 1926. The comparative percentages for the whole Province and the Duars respectively were: *Anopheles hyrcanus* var. *sinensis*, Wied., 40·1 and 2·7, *A. fuliginosus*, Giles, 25·9 and 2·7, *A. subpictus*, Grassi (*rossi*, Giles) and *A. vagus*, Dön., together 16·4 and 72·4, *A. barbirostris*, Wulp, 9·4 and 0·2, *A. aconitus*, Dön., 3·6 and 0, *A. culicifacies*, Giles, 2·5 and 2·8, and *A. pseudojamesi*, Strickl. & Chdy., 1·2 and 0. In the Duars *A. funestus*, Giles (of which the authors consider *A. listoni*, List., and *A. minimus*, Theo., to be synonyms), *A. maculatus*, Theo., and *A. jamesi*, Theo., which occurred in very small numbers in the Province as a whole, constituted 5·1, 11·6 and 2·1 per cent., respectively, of the larvae taken, although the numbers of the first two must have included *A. maculipalpis*, Giles, the adults of which were quite common. Other species, each of which constituted less than 1 per cent. of the total, either in the Duars or in the whole Province, were *A. tessellatus*, Theo., *A. pallidus*, Theo., *A. kochi*, Dön., *A. karwari*, James, *A. leucosphyrus*, Dön., *A. stephensi*, List., *A. theobaldi*, Giles, *A. ludlowi*, Theo., and *A. gigas* var. *simlensis*, James & List.

There appears to be very little difference between North and South (Lower) Bengal with regard to the relative prevalence of various species of *Anopheles*, the percentages of *A. hyrcanus* var. *sinensis*, *A. barbirostris*, *A. fuliginosus* and *A. subpictus* with *A. vagus*, which together comprised about 94 per cent. of the larvae taken, corresponding very closely in the two areas. In Lower Bengal, however, the percentages of the species are different in the east and the west, being, respectively, for *A. hyrcanus* var. *sinensis* 47·6 and 33, *A. barbirostris* 10 and 8·6, *A. fuliginosus* 21·7 and 27·9, *A. vagus* 9·1 and 12·5, *A. subpictus* 0·3 and 6·7, *A. aconitus* 7·8 and 1·8 and *A. culicifacies* 0 and 6·1.

Previous work on the Anophelines of Bengal is reviewed.

PURI (I. M.). **A Note on the full-grown Larvae of *Anopheles jamesi* Theobald, *A. fuliginosus* Giles, *A. pallidus* Theobald and *A. ramsayi* Covell (Culicidae, Diptera).**—*Ind. J. Med. Res.*, xv, no. 2, pp. 511–517, 2 pls., 11 refs. Calcutta, October 1927.

Descriptions are given, based on the moults of the last larval instar, of the larvae of *Anopheles jamesi*, Theo., *A. fuliginosus*, Giles, *A. pallidus*, Theo., *A. ramsayi*, Covell, and a species believed to be *A. philippinensis*, Ludl. Certain characters of the adult of the last species, which has been obtained in Bombay, Coorg and Assam, are also described. The characters of the larva of *A. ramsayi* are identical with those given by Strickland and Chowdhury in their description of *A. pseudojamesi* [*R.A.E.*, B, xv, 162], and the figure of the male genitalia of the adult given by these authors agrees with the description given by Covell for *A. ramsayi* [B, xv, 207]; the author therefore considers that these two species are probably identical, although the adult of *A. ramsayi* differs from that of *A. jamesi* in several characters, which are tabulated, while the adult of *A. pseudojamesi* is stated to differ from that of *A. jamesi* only in the male genitalia and in the scaling of the hind legs.

BARRAUD (P. J.). **A Note on Rat Fleas collected in Assam.**—*Ind. J. Med. Res.*, xv, no. 2, pp. 519–521, 4 refs. Calcutta, October 1927.

A collection of fleas made in April 1927 at Gauhati, in north-western Assam, from 17 rats, 16 of which were *Mus rattus* and one probably *Nesokia bengalensis*, comprised 152 *Xenopsylla cheopis*, Roths., and one *X. astia*, Roths. (on *M. rattus*), the largest number of fleas taken from one rat being 45. Sixty-two fleas collected from rats at Shillong, about 40 miles to the south, in 1922, were all *X. cheopis*. Assam appears to be almost immune from plague; an imported case occurred in 1918 in a village about 25 miles from Gauhati, but the infection did not spread and no mortality was noticed among rats.

SHORTT (H. E.) & SWAMINATH (C. S.). ***Monocystis mackiei* n. sp., parasitic in *Phlebotomus argentipes*, Ann. and Brun.**—*Ind. J. Med. Res.*, xv, no. 2, pp. 539–552, 4 pls. Calcutta, October 1927.

The morphology and life-cycle of the Gregarine, *Monocystis mackiei*, sp. n., are described. The parasite was found in about 25 per cent. of adult *Phlebotomus argentipes*, Ann. & Brun., caught in nature in Assam, and occurred in 100 per cent. of these flies reared in captivity [but did not apparently affect their feeding or longevity, *R.A.E.*, B, xiv, 145]. Large numbers of oocysts of *M. mackiei* are evacuated by an infected female of *P. argentipes* with each egg laid, and are ingested by the larvae of the sandfly as soon as they begin to feed. The Gregarines reach the adult stage within the larvae of the host.

SCHARFF (J. W.). **An Address on Mosquitoes and Malaria.**—*Malayan Med. J.*, ii, no. 4, pp. 138–143, 1 fig. Singapore, December 1927.

This is a popular lecture on mosquitos, their relation to malaria and their control, with special reference to Singapore, where the principal malaria carriers are *Anopheles maculatus*, Theo., which breeds in fresh spring water, and *A. ludlowi*, Theo., which breeds in salt water.

RYLES (C. S.) & MAJUMDER (B. C.). **The Use of Petrol as a Larvicide in Wells, Tanks and similar Collections of Water used for drinking or domestic Purposes.**—*Malayan Med. J.*, ii, no. 4, p. 144. Singapore, December 1927.

After laboratory experiments in which it was found that a small quantity of petrol rapidly killed both Anopheline and Culicine larvae when stirred into water, further experiments were made in wells, which are known to be breeding-places of *Anopheles maculatus*, Theo. All larvae in a well with a surface area of $19\frac{3}{4}$ sq. ft. were killed immediately by the application of 7 oz. petrol. In another well with a surface area of 81 sq. ft., the sides of which were covered with weeds and algae, 12 oz. petrol was used, the water being stirred with a stick; most of the larvae died immediately, but some escaped in the growth at the edges, which was, however, killed. In a similar well of the same size all larvae were killed by spraying the surface with 24 oz. petrol without stirring the water; the authors consider, however, that it is preferable to stir the water with a swizzle stick, which should be dipped in a bucket of petrol, thus possibly reducing the amount needed. In the laboratory it was found that when 1 dram of petrol was completely mixed with 4 lb. water an appreciable taste remained after 24 hours, but in the field experiments no smell of petrol remained after 2 hours and no taste after 3 hours. It is suggested that wells should be treated in the evening, using 24 oz. petrol to 80 sq. ft.

LEWTHWAITE (R). **Japanese River Fever.**—*Malayan Med. J.*, ii, no. 4, pp. 145–148. Singapore, December 1927.

An account is given of the distribution, cause and treatment of tsutsugamushi disease, four cases of which occurred in Selangor in 1926 [*R.A.E.*, B, xvi, 47], three being on one estate. Mites found on natives in the district at the time that the cases occurred were identified as *Trombicula pseudoakamushi*, Hatori, a harmless species, but mites from rats on the affected estate proved to be *T. deliensis*, Walch, the carrier of the disease in Sumatra, and in 1927 mites believed to be *T. akamushi*, Brumpt, the carrier of the disease in Japan, were found.

SASAKI (C.). ***Ceratopogon shimai*, a new Midge affecting the domestic Fowl.**—*Proc. Imp. Acad. Tokyo*, iii, no. 10, pp. 687–689, 7 figs. Tokyo, December 1927.

Ceratopogon shimai, sp. n., is recorded as a serious pest of fowls, and it also attacks man. It appears from June to October, sucking blood from the combs of fowls at night and hiding by day. All the specimens found were females.

RUMBALL (P.). **Some External Parasites of Poultry.**—*Queensland Agric. J.*, xxviii, pt. 6, pp. 633–637, 4 figs. Brisbane, 1st December 1927.

A popular account of the more common external parasites of poultry in Queensland is given, together with measures for their control.

FIELDING (J. W.). **Further Observations on the Life History of the Eye Worm of Poultry.**—*Aust. J. Exptl. Biol. Med. Sci.*, iv, pt. 4, pp. 273–281, 1 ref. Adelaide, 16th December 1927.

In a previous paper on the transmission of the eye worm of poultry, *Oxyspirura parvovum*, in Australia [*R.A.E.*, B, xv, 77], the author stated that the cockroach, *Pycnoscelus surinamensis*, L., which is the intermediate host of the Nematode, became infected by ingesting the larvae. Further experiments were carried out, and it was found that the eggs of the Nematode would hatch in various media, but that the larvae only survived for a short time. Cockroaches became infected by eating bread containing eggs and larvae, and it is now considered that the eggs normally hatch in the gut of the cockroach. One larva was seen emerging from the egg in a cockroach 6 days after the initial feed and two days after the last possible ingestion of eggs, and larvae were observed in the gut 6 days, and in the body cavity 6–9 days, after the last possible ingestion of eggs. Encapsulated larvae were first found in 17 days from the initial feed, but were not infective until 35 days later, when Nematodes appeared after a few minutes in the eyes of chicks fed on cockroaches harbouring capsules. That the stimulus causing the Nematodes to leave the cockroach is warmth was shown by placing cockroaches in water at a temperature of 35–37° C. [95–98·6° F.], when the larvae began to pass through the thinner parts of the body almost immediately. Egg-laying by the Nematodes was first observed 38 days after chicks became infected. The life-cycle of the parasite is thus completed in about 13 weeks, but it is probable that this time may be somewhat shorter under more favourable conditions. In addition to chicks and ducklings, a pigeon was infected by feeding it on cockroaches harbouring Nematodes. There appears to be a close association between the distribution of *Pycnoscelus surinamensis* and *Oxyspirura parvovum* in Australia and that of the same cockroach and *O. mansonii* in other parts of the world.

LEVICK (G. T.). **The House Fly.**—*J. Dept. Agric. Vict.*, xxv, pt. 11, pp. 669–672. Melbourne, November 1927.

This is a brief and popular account of the life-history of *Musca domestica*, L., showing the importance of controlling the breeding of the flies and preventing their access to food. The usual preventive and remedial measures are briefly discussed.

WOLLMAN (E.). **Le rôle des mouches dans le transport de quelques germes importants pour la pathologie tunisienne.**—*Arch. Inst. Pasteur Tunis*, xvi, no. 4, pp. 347–364, 4 figs., 5 refs. Tunis, December 1927.

The results of previous experiments with flies as carriers of pathogenic bacteria [*R.A.E.*, B, ix, 71, 173] are summarised, and the technique employed in breeding and infecting aseptic flies is described. Further experiments were carried out at Tunis, house-flies [*Musca domestica*, L.] being used in most cases, with the bacilli of acute contagious conjunctivitis (Weeks' bacillus [*Bacillus aegyptius*]), subacute conjunctivitis (diplobacillus of Morax and Axenfeld), plague [*B. pestis*] and contagious abortion (*B. abortus*), the last-named being chosen

on account of its close similarity to *Micrococcus melitensis* (the causal organism of Mediterranean fever), and with *Leishmania tropica*, *Spirochaeta crocidurae* and *S. hispanica*.

House-flies placed in tubes containing cultures of *Bacillus aegyptius* or the diplobacillus of Morax and Axenfeld were infective immediately afterwards, but not after $3\frac{1}{2}$ hours. A specimen of *Lucilia caesar*, L., experimentally infected with *B. abortus*, was kept for 48 hours in a sterile flask and then placed in a tube containing culture medium, on which the bacillus developed after its death; house-flies under similar conditions remained infective for 24 hours. It is assumed, by analogy, that flies may remain infected with *M. melitensis*, which they may acquire from such sources as milk and, particularly, urine of infected goats, for 24 hours. Two house-flies were infected with *B. pestis* and transferred to tubes containing culture medium, one immediately and the other after 6 hours in a sterile flask; *B. pestis* developed promptly in the first case, but only after the death of the fly in the second, showing that the bacillus is preserved in the intestine, but not on the outside of the body, for 6 hours.

Both in the case of *B. pestis* and *M. melitensis* it is possible that infection may be acquired by fly larvae, from dead bodies or faeces, but it has been shown [*loc. cit.*] that such infection is not passed on to the adults, which may, however, become infected as they emerge from the puparia. *B. pestis* does not appear to be pathogenic for flies, as infected flies remained perfectly normal for 6 days, during which time the bacillus must have been eliminated.

The author's investigations show that flies experimentally infected with bacteria remain infective for periods varying from 12 days for the bacilli of typhoid and dysentery [*B. typhosus* and *B. dysenteriae*] to less than $3\frac{1}{2}$ hours for those of conjunctivitis. The natural sterilisation of infected flies is apparently purely mechanical, the structure of their appendages being such that bacteria on them are subjected to the action of light, air and dryness. The relatively long time that flies continue to be vectors of the bacilli of typhoid and dysentery may be explained by the close similarity of these to the bacteria normally present on flies.

Leishmania tropica could not be found after intervals varying from 1 to 12 days in flies that had been placed in contact with cultures of flagellates. Inoculation of aseptic flies experimentally contaminated with *Spirochaeta crocidurae* and aseptic cockroaches experimentally contaminated with *S. crocidurae* and *S. hispanica* into susceptible animals after an interval of 24 hours gave negative results.

BECKER (E. R.). *Herpetomonas arctocorixae* sp. nov. entozoic in the Intestine of the Water-boatman *Arctocorixa interrupta* Say.—*J. Parasit.*, xiv, no. 2, pp. 85–87, 6 figs., 5 refs. Urbana, Ill., December 1927.

The flagellate and aflagellate forms of *Herpetomonas arctocorixae*, sp. n., found in about 5 per cent. of the nymphs and adults of *Arctocorixa interrupta*, Say, near Baltimore, are described, the flagellate form being compared with other insect flagellates. The infections were usually very light, suggesting that they had been acquired from other insects on which this Corixid is predacious, but none of the many other insects inhabiting the water or water's edge was found to be infected. A

curious association of flagellate and aflagellate forms was observed several times, the tip of the flagellum of one individual being attached to the point where the flagellum formerly existed on the other.

KNOWLES (R. H.). **Trypanosomiasis of Camels in the Anglo-Egyptian Sudan: Diagnosis, Chemotherapy, Immunity.**—*J. Comp. Path.*, xl, pts. 1 & 2, pp. 59-71 & 118-143, 1 fig., 19 refs. Croydon, March & June 1927.

Trypanosomiasis of camels caused by *Trypanosoma soudanense* is widespread in the Sudan, chiefly in the south and south-west, the prevalence of the disease following fairly closely the distribution of Tabanids. These flies are recognised as the vectors by the nomadic tribes, who move their camels northwards away from the fly areas during the rainy season. *Tabanus taeniola*, P. de B., and *T. sufis*, Jaenn., are believed to transmit the disease, but other flies such as *Pangonia rüPELLI*, Jaenn., and *Stomoxys* may also be concerned. The disease is the same as that occurring in other parts of north and north-west Africa and is closely allied to, if not identical with, surra of camels in India; *Trypanosoma soudanense* is morphologically indistinguishable from *T. evansi*.

CURSON (H. H.). **Meteorological Conditions and the Seasonal Prevalence of Nagana in Zululand.**—*S. Afr. J. Sci.*, xxiv, pp. 377-381, 3 figs., 7 refs. Johannesburg, December 1927.

Zululand comprises three main regions, the lowlands, midlands and highlands, rainfall being greatest on the coastal lowlands and decreasing as the altitude increases inland; a larger proportion of the total rainfall occurs in the wet season (October to March) inland. The highlands are free from bush growth and consequently not suitable for *Glossina*, which is confined to the wooded midlands and lowlands.

Charts are given showing the relation of the monthly rainfall to the occurrence of nagana (trypanosomiasis) of cattle, and it is seen that, although cattle may be bitten by *Glossina* in the wet season, the disease is most prevalent during the dry season (April to September), when temperature and humidity are at their minimum and the nutritive value of pasture is poor, and it quickly disappears after the beginning of the spring rains [cf. *R.A.E.*, B, xv, 89].

CAWSTON (F. G.). **Dengue Fever and defective Gutterings.**—*S. Afr. J. Sci.*, xxiv, pp. 386-387. Johannesburg, December 1927.

Attention is drawn to the part played by defective roof gutters in providing breeding-places for the mosquitos associated with dengue, an outbreak of which disease, affecting some 30,000 people, recently occurred on the coast of Natal. The method of constructing gutters that will not retain sufficient water for mosquito breeding is described in somewhat greater detail than in two papers previously noticed [*R.A.E.*, B, xv, 233; xvi, 98].

LEESON (H. S.). **Preliminary Notes on the Anophelini of Southern Rhodesia.**—*S. Afr. J. Sci.*, xxiv, pp. 424-428. Johannesburg, December 1927.

A study of the Anopheline mosquitos of Southern Rhodesia was begun in September 1926 with a view to comparing the distribution

of the breeding-places of the various species with the incidence of blackwater fever. Of the twelve species of which larvae were collected from September 1926 to May 1927, *Anopheles christyi*, N. & C., *A. cinereus*, Theo., and *A. marshalli*, Theo., were not taken in sufficient numbers for data to be recorded. Notes are given on the local distribution and breeding-places of the other nine species, of which *A. pretoriensis*, Theo., *A. squamosus*, Theo., *A. gambiae*, Giles (*costalis*, Theo.), *A. funestus*, Giles, and *A. rufipes*, Gough, were predominant. *A. squamosus* bred mainly in ponds exposed to direct sunlight. The larvae of *A. pretoriensis*, which is probably the commonest Anopheline in Southern Rhodesia, occurred in drainage ditches overgrown with grass, shallow puddles at the margins of streams, and swamps; the adults were found chiefly in unoccupied native huts and outhouses, rarely in association with human beings. The larvae of *A. funestus* occurred in the shady parts of small streams and ponds, and the adults in unoccupied native huts and, to a less extent, in occupied European quarters. The larvae of *A. rufipes* are found mainly in ponds, swamps and the quiet parts of streams, the adults being collected frequently from garages, cattle sheds and European houses. *A. gambiae* breeds at the edges of streams, in pools, swamps, etc., where the water is exposed to sunlight; the adults are found frequently in occupied native huts and less commonly in European quarters, preferring dark, airless rooms and avoiding light and airy houses; houses are most liable to be invaded when long grass or low scrub approach within about a hundred yards to the windward. In connection with *A. gambiae*, which is the species found continuously throughout the areas in which blackwater fever occurs in Southern Rhodesia, the author points out that where it is not practicable to prevent breeding, houses and native quarters should be built to the windward of breeding-places, the house being to the windward of the native quarters. *A. maculipalpis*, Giles, bred in very shallow water exposed to the sun, *A. argenteolobatus*, Gough, which was only found in one locality, in ponds and holes in the ground, *A. rhodesiensis*, Theo., in springs and pools, and *A. mauritanus*, Grp., at the edges of streams, and in ponds, marsh puddles and cattle hoof-marks; other species found in hoof-marks were *A. funestus*, *A. maculipalpis*, *A. squamosus* and *A. rufipes*.

FANTHAM (H. B.) & ROBERTSON (K. G.). **Some parasitic Protozoa found in South Africa.** X.—*S. Afr. J. Sci.*, xxiv, pp. 441–449, 1 pl., 3 refs. Johannesburg, December 1927.

Observations on the biological reactions of *Herpetomonas luciliae*, obtained from *Lucilia sericata*, Mg., to a number of organic and inorganic substances are recorded. At Johannesburg the flies begin to emerge with the onset of warm weather in September and disappear in April. Flagellates were first found in the flies about the middle of September, but the number of infected flies was small during the early part of the season. From November to January a large proportion of the flies harboured Herpetomonads, about 12 per cent. being heavily infected; but with the decrease in temperature and diminution in the numbers of *L. sericata* at the end of the summer (March), the percentage of infected flies became smaller, the last being found at the beginning of April.

In experiments with laboratory-bred adults of *Musca domestica*, L., a proportion became infected when fed on an emulsion of the gut-

contents of *L. sericata* harbouring *H. luciliae*. Larvae of *M. domestica* also became infected in some cases when fed on meat contaminated with *H. luciliae*, but the Herpetomonad was not found in the pupae.

JACK (R. W.). **Some environmental Factors relating to the Distribution of *Glossina morsitans* Westw. in Southern Rhodesia.**—*S. Afr. J. Sci.*, xxiv, pp. 457–475, 1 map. Johannesburg, December 1927.

In this paper an attempt is made to determine the influence of climate, altitude, geology and vegetation on the distribution of *Glossina morsitans*, Westw., in Southern Rhodesia. The distribution of the fly at the present time is inconstant, the limits of its range changing year by year, chiefly, if not wholly, in the direction of expansion, and is therefore of little significance in connection with the influence of permanent environmental factors in limiting its spread, but it is thought that its distribution at the time when Rhodesia was traversed by hunters and explorers previous to the European occupation, on which fairly accurate data are available, indicates broadly the zones that fall within the range of its adaptability.

Elevation is apparently one of the most potent factors limiting the distribution of all species of tsetse-flies, and *G. morsitans* does not seem to have occurred at altitudes above about 4,000 ft. in Southern Rhodesia; in the centre of the Colony the former fly limit corresponds very closely with the 4,000 ft. contour, but as the influence of elevation is presumably indirect, this will not necessarily be the case over the considerable variations in climate occurring in the Colony.

From a consideration of the records, the inference is drawn that the minimum annual mean temperature that admits of the continued prevalence of the fly in Southern Rhodesia is about 69° F. The influence of too low a temperature is difficult to understand; the most obvious explanation is that it tends to slow down reproduction beyond the critical point. If this is the case, it might be expected that the fly would decrease as the critical elevation and mean temperature are approached, but the influence of other factors makes uniformity in relation to any one unlikely. It is probable that 70° F. is about the normal mean temperature in some areas quite heavily infested, but the excessive prevalence of *G. morsitans* in the Zambesi Valley suggests that the optimum annual mean temperature is nearer 80° F. Mean temperature is, however, a less decisive factor above the critical point than some others.

The correlation between the former distribution of *G. morsitans* in Southern Rhodesia and rainfall is much less definite. Broadly, the fly areas occupy and have occupied the drier parts of the Colony, but these are also mainly the lower and warmer parts. At suitable elevations, however, the fly is prevalent where the average annual rainfall is more than 30 ins., and no diminution or retrogression has been noted following the exceptionally wet seasons of 1924–25 and 1925–26. It has existed and does exist in districts where drought is almost perennial, such as the country near the Limpopo and Bechuanaland.

As regards geological formations, it would appear that sandy soils generally are unsuitable to *G. morsitans*, though at least one sandy tract on the Karoo System is infested, and there are records of sandy soils being infested in other parts of Africa.

Four classes of forest are chiefly met with in the tsetse-fly areas of Southern Rhodesia; three of these are of the savannah type, the

dominant trees being deciduous, and the fourth is mainly evergreen and may form close-type forest on river banks or savannah forest on the margins of the low-lying, open grassland. Seasonal distribution of *G. morsitans* in relation to the various types is determined largely by the leaf-fall and time of flushing, the fly leaving forest that is bare of foliage and concentrating where the trees are still in leaf. Where the savannah forest becomes leafless over considerable areas, the evergreen trees of the stream-bank forest provide shade in which intense concentrations of fly may take place, but very dense forest of this type seems to be avoided. The regular visits of the game to the open grassy areas and river banks provide a regular supply of blood for the flies at a time when reproduction tends to be at its maximum. The dispersal of *G. morsitans* from these dry season haunts appears to be very rapid. The centres of concentration lose their special attraction to game very shortly after the general rains have fallen. Although surface water may be present where concentration occurs, the essential factor appears to be sufficient underground water to induce the growth of evergreen trees.

Mopane forest, in which the dominant tree is *Copaiifera mopane*, occurs on ill-drained soil that cracks extensively in the dry season; it is frequently waterlogged in the wet season; it is the natural habitat of impala antelope and much frequented by other game, and is highly favourable to *G. morsitans*, comprising the greater part of the fly-infested area in the Colony. Brachystegia forest, the dominant trees of which are *Brachystegia* spp. and *Berlinia globiflora*, occurs on very variable but well-drained soils; it is more shady than mopane forest, but not so clean-stemmed, and is preferred by sable and eland, but avoided by impala. Late dry season concentrations of game are not so marked as in mopane country and the movement of animals generally is more irregular. It is hardly so favourable as mopane for *G. morsitans*, but the fly may be abundant in specially suitable localities and shows a greater tendency to thin distribution over a somewhat indefinite area, while seasonal concentrations are generally less marked, probably because leaflessness is not usually prevalent over wide areas or so prolonged as in the mopane. Gusu forest, in which the dominant trees are *Baikiaea plurijuga* and *Copaiifera coleosperma*, occurs on the deep sands of the Kalahari System, and is favoured by eland and sable, but game movements appear to be very irregular and wide areas are almost completely waterless; it is largely avoided by *G. morsitans*. Certain localities where the mopane forest comes in contact with the brachystegia or gusu types are particularly favourable to *G. morsitans*, as they may be moister than the adjoining country of either type, providing grass early, and combining warmth, shade, shelter and attractiveness to game.

The savannah forests of the northern part of Southern Rhodesia do not differ very widely in general character, although the mopane forest is in general more clean-stemmed and has an undergrowth of shorter grass than the other types. If the tsetse-fly finds its hosts solely by sight, as seems to be generally held, the value to it of the mopane type is clear. It appears quite unlikely, however, that tsetse-fly could survive in this type of forest, on account of its highly deciduous habit and possibly its liability to inundation after heavy rains, were it not for the patches of evergreen trees occurring in the vicinity; there is thus a chance in some localities of controlling the fly by removing the late dry season's shade where this is of

sufficiently limited extent. It appears that exclusion of *G. morsitans* through the direct influence of the forest itself is confined to types that are either deficient in shade or of too dense a character. Forest of the latter type is extremely limited in the Colony, and may be ignored. Completely open country is not suitable to the fly, but the author found one very thinly forested area much frequented by game to be infested. Food supply seems to be a more potent factor than forest density, and the author thinks that the general avoidance of Kalahari Sand and gusu forest may be due to this. He considers it possible that almost all areas that are forested and not of too dense a character are suitable for *G. morsitans*, provided that the average annual mean temperature is not below 69° F., and a suitable and sufficient food supply is available.

- NIESCHULZ (O.). **Zoölogische bijdragen tot het Surraprobleem.** [Zoo-logical Contributions to the Problem of Surra.]
- VI. Overzicht over de tot nu toe bereikte resultaten.** [Survey of the Results obtained hitherto.]—*Handel. Vierde Ned.-Ind. natuurw. Congr. 1926*, pp. 329-335, 2 pls. Weltevreden [1927].
- VII. Einige neue Tabaniden von Java und Sumatra.** [Some new Tabanids from Java and Sumatra.]—*Treubia*, ix, no. 4, pp. 447-456, 11 figs., 1 pl., 4 refs. Buitenzorg, 1927.
- IX.** (with PONTO, S. A. S.). **Overbrengingsproeven met *Tabanus flavivittatus*, Schuurm. Stekh., en *Haematopota pungens*, Dol.** [Transmission Experiments with *T. flavivittatus* and *H. pungens*.]—*Veeartsenijk. Meded.*, no. 60, 11 pp., 2 figs. Buitenzorg, 1927. (With a Summary in German.)
- XI. Enkele proeven met *Haematopota truncata*, Schuurm. Stekh., *H. irrorata*, Macq., en *Tabanus brunnipes*, Sch. Stekh.** [Some Experiments with *H. truncata*, *H. irrorata* and *T. brunnipes*.]—*Op. cit.*, no. 61, 13 pp., 3 figs., 3 refs. 1927. (With a Summary in German.)
- XIII. Ueber die Möglichkeit biologischer Surrabekämpfung.** [The Possibility of biological Control of Surra.]—*Abh. Gebiete Auslandsk., Hamburgische Univ.*, xxvi, Ser. D. (Med.), ii (Festschrift NOCHT), pp. 380-385, 24 refs. Hamburg, 1927.
- XV.** (with PONTO, S. A. S.). **Enkele overbrengingsproeven met *Chrysops flaviventris*, Macq., en *C. dispar*, Fabr.** [Some Transmission Experiments with *C. flaviventris* and *C. dispar*.]—*Veeartsenijk. Meded.*, no. 62, 14 pp., 2 figs., 3 refs. Buitenzorg, 1927. (With a Summary in German.)
- XVII. Weitere Surraübertragungsversuche mit *Tabanus rubidus*, Wied.** [Further Surra Transmission Experiments with *T. rubidus*.]—*Arch. Protistenk.*, lxi, no. 1, pp. 92-118, 2 figs., 14 refs. Jena, 1st March 1928.
- XVIII.** (with PONTO, S. A. S.). **Over meervoudige infecties met *Tabanus striatus*, Fabr.** [On several Infections with *T. striatus*.]—*Veeartsenijk. Meded.*, no. 63, 8 pp., 4 refs. Buitenzorg, 1927. (With a Summary in German.)
- XIX. Overbrengingsproeven met** [Transmission Experiments with] *Stomoxys*, *Lyperosia*, *Musca* en *Stegomyia*.—*Op. cit.*, no. 64, 20 pp., 14 refs. 1927. (With a Summary in German.)

The contents of the first two of these contributions are indicated by their titles.

Paper ix records positive results in the direct transmission of surra experimentally from horse to horse by *Tabanus flavivittatus*, Sch. Stek., after an interrupted feed. Curiously enough, such transmission failed with *Haematopota pungens*, Dol., but the infection was transmitted half an hour after the flies had fed. Paper xi records the successful experimental direct transmission of surra from horse to horse by *Haematopota truncata*, Sch. Stek., and from dog to guineapig by *H. irrorata*, Macq., and *Tabanus brunnipes*, Sch. Stek. These experiments confirmed the fact that transmission is easier and more certain with *Tabanus* than with *Haematopota*. In paper xiii a survey is given of the recorded vectors of surra and of the remedial measures that have been tried against Tabanids. It is concluded that at present no successful biological method of controlling these flies is known.

Experiments described in paper xv prove that *Chrysops flaviventris*, Macq., is capable of transmission from horse to horse either immediately or after an interval of half an hour. With *C. dispar*, Macq., only an immediate transmission succeeded. No successful transmissions with *Chrysops* appear to have been recorded previous to these experiments. The flies of this genus evidently do not convey surra so readily as *Tabanus*.

In paper xvii are described numerous experiments on the transmission of surra by *Tabanus rubidus*, Wied., from infected horses to healthy ones as well as mice and guineapigs. While direct transmission is easy, the longer the time that elapses after the fly bites the infected animal, the less likelihood there is of infection. The normal maximum interval after which infection can occur appears to be about 6 hours. After an interval of 24 hours, infection must be extremely rare.

Paper xviii deals with experiments with *Tabanus striatus*, F. Surra from a horse was transmitted to three guineapigs in succession. Such transmission to several horses seems probable, but the question of expense precluded testing this.

Paper xix describes unsuccessful attempts to convey surra from horse to horse by means of Diptera other than Tabanids, viz., *Stomoxys calcitrans*, L., *Lyperosia exigua*, de Meij., *Musca inferior*, Stein, *M. crassirostris*, Stein, and *Aedes (Stegomyia) albopictus*, Skuse.

WALCH (E. W.). **Nederlandsch-Indische Trombiculae en verwante Mijten.** (Derde Mitteilung.) Soorten uit de Lampongsche districten en de omgeving van Makassar. [Dutch East Indian Trombiculae and allied Mites. (Third Communication.) Species from the Lampong Districts and the Neighbourhood of Macassar.] — *Geneesk. Tijdschr. Ned.-Ind.*, lxxvii, no. 6, pp. 922-933, 12 figs., 2 tables, 7 refs. Weltevreden, 1927. (With a Summary in English.)

A study is necessary of the distribution in the Dutch East Indies of *Trombicula deliensis*, Walch, and *T. schüffneri*, Walch, which have been found in Deli, East Sumatra, and are considered to be the chief carriers of tsutsugamushi disease. Up to now the disease has been recorded in the Dutch East Indies only from Deli. In the Lampong districts, South Sumatra, four species were found to attack man and rats, *Trombidium acuscutellare*, Walch, *Trombicula pseudokamushi*, Hatori, *T. deliensis* and *T. pseudoschüffneri*, sp. n. In addition, rats were parasitised by *T. (Schöngastia) indica*, Hrst. (of

which *T. muris*, Walch, is a synonym), *T. oudemansi*, Walch, and *Trombidium glabrum*, sp. n. The chief interest centres on the occurrence of *Trombicula deliensis*, but no information could be secured concerning the occurrence of tsutsugamushi disease. *Trombidium acuscutellare* had not previously been found on man. In Deli *Trombicula pseudoakamushi* does not attack rats. In the neighbourhood of Macassar (Celebes), *T. indica*, *Leeuwenhoekia australiensis* Hrst. (new to the Dutch East Indies), *Trombidium globulare*, sp. n., and *Trombicula pseudoakamushi* occur on rats, no vectors of tsutsugamushi disease being found.

As regards the nomenclature of these mites, the form of the pseudostigmatic organs of the larvae is not considered a good character for generic classification, because there are *Trombidium* larvae with club-shaped hairs with four, and also with five or six ordinary hairs on the scutum. It is proposed to use the genus *Trombicula* to include also those larvae with club-shaped sensory hairs that are similar in other respects. These could be placed together in a subgenus for which the name *Schöngastia*, Oudemans, is available.

[NASONOV (N. V.).] **Насонов (Н. В.). On the Distribution of *Phlebotomus* and Sandfly Fever in the Crimea. [In Russian.]**—*C.R. Acad. Sci. U.R.S.S.*, 1927, pp. 367–370, 2 figs., 2 refs. Leningrad, 1927. (With a Summary in French.)

It is evident from data received from various parts of the Crimea that sandflies are becoming more abundant along the coast south of the Yaila mountains, but sandfly fever has only been observed in other localities, including Sevastopol and Simferopol.

Of the sandflies collected on this coast, 102 males were examined, and these were all identified as *Phlebotomus perniciosus* var. *tauricus*, n.

[MOSKVIN (I. A.).] **Москвин (И. А.). On the Rôle of the Tick (*Ixodoidea*), *Ornithodoros papillipes*, Bir. (Turkestan), in the Transmission of Relapsing Fever. [In Russian.]**—*C.R. Acad. Sci. U.R.S.S.*, 1927, pp. 375–380, 1 fig., 2 refs. Leningrad, 1927.

Relapsing fever is one of the epidemic diseases occurring in Uzbekistan and has been confused with malaria. According to Magnitzkii, *Argas persicus*, Oken, is the transmitting agent, but this parasite of fowls is seldom found in human dwellings. The most common tick is *Ornithodoros papillipes*, Birula (determined by Pavlovskii), which up to 1926 was confused with *O. tholozani*, Lab. & Mégn., and *O. lahorensis*, Neum., which have been recorded by Latuishev [cf. *R.A.E.*, B, xv, 95, 215; xvi, 38] and Troitzkii as vectors. *O. tholozani* is very rare in parts of the Kashka-Dar'insk region infected with relapsing fever.

Cases of relapsing fever observed in 1927 are discussed; the disease appeared 7–9 days after the patient had been bitten by *O. papillipes*. Subsequent experiments with laboratory animals have proved this tick to be capable of transmitting the disease by the bite only. It does not emit coxal fluid while biting. Inoculations of coxal fluid or an emulsion made from crushed ticks did not produce infection. The ticks used in the transmission experiments were either caught under

normal conditions and placed on the animal or given a preliminary infective feed, by ingesting defibrinated blood through the membrane of a bat's wing.

PAMPANA (E. J.). **Notes on Colombian Relapsing Fever.**—*Trans. Soc. Trop. Med. Hyg.*, xxi, no. 4, pp. 315–328, 3 charts, 11 refs. London, January 1928.

This paper deals mainly with the clinical aspects and treatment of relapsing fever, as a result of observations made on 91 cases in a mining district of Colombia. The spirochaete is probably *Spirochaeta neotropicalis*, which occurs elsewhere in Colombia and in Panama. The characteristic epidemiological feature of the disease is that infection is contracted in some definite place, such as a room of a house, where the transmitting agent, *Ornithodoros talaje*, Guér., happens to be present and infective. These ticks occur in most native huts, they crawl very slowly and can live for months without food. They are seldom carried by men on their bodies or among clothing, but are commonly transported with bedding. Once a house is infested by infected ticks, it remains potentially infective for months, either by the persistence of the infected adult ticks, or by the transmission of the infection to their offspring.

KLIGLER (I. J.). **Simple Method of feeding *Stegomyia* on Blood or Mixtures containing Cultures.**—*Trans. Soc. Trop. Med. Hyg.*, xxi, no. 4, pp. 329–331, 1 fig. London, January 1928.

A series of experiments have been made in which it was found that *Aedes* (*Stegomyia*) [*argenteus*, Poir.] could readily be made to feed in a variety of ways on defibrinated or citrated blood containing a suspension of cultures of *Leptospira icteroides*. Three methods were evolved, the most successful of which is described. The freshly emerged mosquitos are collected in wide mouthed test-tubes, 2–4 in each tube. The cotton plug is replaced by a piece of fine meshed cotton gauze; silk is less suitable. After the mosquitos have been starved for 36–48 hours, the tube is held with the gauze to the light, so that they come to rest on it, and then, without disturbing the mosquitos, the tube is carefully lowered into a petri dish containing the blood mixture. The gauze should come in contact with the blood, but it is best to incline the tube so that only part of the gauze is moistened by it. The mosquitos will feed readily at any time of the day if the temperature is 25° C.–28° C. [77° F.–82·4° F.]. At temperatures below 20° C. [68° F.], it is impossible to get them to feed on the artificial mixture.

FEDERICI (E.). **L'azione tossica delle "Charae" sulle larve dei Culicidi.** [The toxic Action of Species of *Chara* on Culicid Larvae.]—*Redia*, xvi, no. 1–2, pp. 17–28, 18 refs. Florence, 1927.

The author describes a number of laboratory and field experiments on the effect of *Chara* on mosquito larvae that confirm the results obtained by Caballero [*R.A.E.*, B, viii, 61, etc.]. It is, however, evident that the toxic action of this plant has less effect on *Anopheles* and *Culex* than on *Aedes* (*Stegomyia*), and on the older than on newly-hatched larvae. Furthermore, the action is not constant, but depends

on a number of factors difficult to determine. The toxic effect seems due to some substance produced by the functional activity of the plant and probably volatile and easily soluble in water. Results in the field in Italy are, however, less marked than in the confined conditions of the laboratory.

TEODORO (G.). **Osservazioni sul *Pyrrhocoris apterus*, L., con particolare riguardo alla flagellosi.** [Observations on *P. apterus* with special regard to Flagellosis.]—*Redia*, xvi, no. 1-2, pp. 45-50, 11 refs. Florence, 1927.

These investigations were undertaken with the object of ascertaining the source of the infection with *Herpetomonas pyrrhocoris* that occurs in *Pyrrhocoris apterus*, L. This bug is predominantly carnivorous, feeding readily on other insects, and is cannibalistic in both the larval and adult stages. It evidently acquires the flagellates by devouring insects already infected with them.

FEDERICI (E.). **La suzione degli alimenti nei Culicidi e l'ipotesi di una diretta trasmissibilità dell' infezione malarica.** [The Suction of Food in Mosquitos and the Hypothesis of a direct Conveyance of Malaria.]—*Redia*, xvi, no. 1-2, pp. 51-68, 17 refs. Florence, 1927.

The mouth-parts of mosquitos and the means by which they take in fluids are discussed. It is considered highly improbable that malaria can be directly transmitted by regurgitation.

FEDERICI (E.). **La larva svernante di *Anopheles bifurcatus*, L.** [The hibernating Larva of *A. bifurcatus*.]—*Redia*, xvi, no. 1-2, pp. 89-100, 15 refs. Florence, 1927.

As a result of observations on the malpighian tubes, adipose tissue, pericardial cells, etc., in the larva of *Anopheles bifurcatus*, L., it is concluded that the functional condition of the excretory organs is much the same in winter as in summer. There is no evidence of cyclical asthenobiosis as described by Roubaud in the adults of *Culex pipiens*, L., and *A. maculipennis*, Mg. [*R.A.E.*, B, xiv, 123].

BRUMPT (E.). **Rôle du poisson vivipare américain, *Gambusia holbrooki*, dans la lutte contre le paludisme en Corse.**—*C.R. Acad. Sci. Fr.*, clxxxvi, no. 13, pp. 909-911, 1 fig. Paris, 1928.

The introduction of *Gambusia holbrooki*, under the direction of the author, from Italy into Corsica in 1926 to destroy mosquito larvae has proved extremely successful, hardly one larva being collected in 1927 from places where in 1926 an average of 300-500 to the square yard was taken. That this satisfactory result was due to the fish and not to climatic conditions was proved by the investigation of four boats on a canal, all containing water, in three of which were found large numbers of mosquito larvae, while in the fourth, which contained a few *Gambusia*, accidentally introduced, not a single larva could be found. The canal itself was well stocked with the fish, and larvae were extremely rare.

SCHUBERG (A.). **Das gegenwärtige und frühere Vorkommen der Malaria und die Verbreitung der Anophelesmücken im Gebiete des Deutschen Reiches.** [The present and former Occurrence of Malaria and the Distribution of *Anopheles* in Germany.]—*Arb. Reichsgesundheitsamt*, lix, no. 1-2, pp. 1-427, 1 map, 511 refs. Berlin, 1927.

This detailed survey of the occurrence of malaria and *Anopheles* has been prepared from official reports and scientific literature and is in general limited to the regions of post-war Germany.

MATHIS (C.), SELLARDS (A. W.) & LAIGRET (J.). **Sensibilité du *Macacus rhesus* au virus de la fièvre jaune.**—*C.R. Acad. Sci. Fr.*, clxxxvi, no. 9, pp. 604-606, 3 refs. Paris, 1928.

The successful experimental transmission of the virus of yellow fever from man to monkeys (*Macacus rhesus*) by means of *Aedes argenteus* is described.

MARTINI (E.). **Ueber die Gelbfieberleptospira (*Leptospira icteroides* Noguchi) im Vergleich zur *Leptospira* der Weilschen Krankheit (synonym *Spirochaeta icterogenes* Uhlenhuth und Fromme, *Spirochaeta nodosa* Huebner und Reiter, *Spirochaeta icterohaemorrhagiae* Inada, Ido, Hoki, Kaneko und Ito, Weilsche *Spirochaete* Ungermann und Zuelzer).** [A Comparison of the *Leptospira* of Yellow Fever with that of Weil's Disease.]—*Centralbl. Bakt.*, (1) Orig., cv, no. 6-8, pp. 402-407. Jena, 15th February 1928.

In maintaining cultures of *Leptospira icteroides*, the causal organism of yellow fever, and *L. icterohaemorrhagiae*, the causal organism of infectious jaundice, for the purpose of yellow-fever diagnosis, it was found that *L. icteroides* is capable of surviving for three years. It is suggested that this long period of survival may enable *Aedes argenteus*, Poir., to cause outbreaks of the disease after long intervals of time.

SAWYER (W. A.) & BAUER (J. H.). **Survival of *Leptospira icteroides* in various Environments.**—*Amer. J. Trop. Med.*, viii, no. 1, pp. 17-28. Baltimore, Md., January 1928.

During previous unsuccessful attempts to transmit *Leptospira icteroides* from guineapig to guineapig by means of *Aedes argenteus*, Poir. (*aegypti*, L.), it was seen that it tended to disappear quickly in the mosquitos. In studies reported on in the latter part of this paper pure cultures of *L. icteroides* were obtained from *A. argenteus* that had fed nine hours before on a guineapig infected with the organism. The organism could not be recovered after it had been twelve hours or more in the mosquito.

EWING (H. E.). U.S. Bur. Ent. **Observations on the Habits and the Injury caused by the Bites or Stings of some common North American Arthropods.**—*Amer. J. Trop. Med.*, viii, no. 1, pp. 39-62, 4 figs., 6 refs. Baltimore, Md., January 1928.

This paper gives the results of studies carried on over a period of four years with a view to gaining more definite knowledge concerning the habits of stinging and biting Arthropods in the United States and

the effect they produce. The species dealt with include *Centruroides vittatus*, Say (common striped scorpion), *Mastigoproctus giganteus*, Lucas (giant whip scorpion), *Eurypelma californica*, Ausserer (common tarantula), *Pamphobeteus* sp., *Pachylomerus audouinii*, Lucas (common eastern trap-door spider), *Lycosa carolinensis*, Walck., *L. punctulata*, Hentz, *Latrodectus mactans*, F. (black widow), *Scutigera forceps*, Raf. (house centipede), *Benacus griseus*, Say (giant water bug), *Nabis rosipennis*, Reut., and *Vespa germanica*, F. A brief account is given of the life-history, habitat, food and habits of each species, together with the effect of its bite or sting on man.

ROUBAUD (E.). **Sur l'inaptitude du *Plasmodium praecox* à l'évolution hivernale chez l'*Anopheles maculipennis*, et ses conséquences épidémiologiques pour l'Europe septentrionale.**—*C.R. Acad. Sci. Fr.*, clxxvi, no. 5, pp. 329–331, 7 refs. Paris, 1928.

The optimum hibernation temperature for *Anopheles maculipennis*, Mg., has been shown to be between 14 and 17° C. [57·2 and 62·6° F.]. In the case of *Plasmodium vivax*, Jansco has shown that at from 15° C. [59° F.] to 17° C. development is possible, though very slow (53 days), and in the neighbourhood of Amsterdam, two complete successive cycles of the parasite, each of about 2 months, can be observed from autumn to spring in the Anophelines of central Holland [*R.A.E.*, B, xii, 174].

As regards *P. falciparum* (*praecox*), data are lacking, though the absence of development of this parasite in *A. maculipennis* hibernating at room temperature has been noted. Experiments with 24 individuals of this mosquito tend to confirm the author's previous opinion that the winter development of *P. falciparum* is impossible under conditions in which it occurs in *P. vivax*. This is the principal reason that malignant tertian malaria has more quickly and more completely disappeared from northern Europe than benign tertian. Both are equally and effectively diverted from man during the warm months in agricultural districts owing to the attraction for the mosquito exerted by domestic animals.

PICARD (F.). **Les facteurs de répartition géographique du *Plasmodium vivax* et *Plasmodium praecox*.**—*C.R. Acad. Sci. Fr.*, clxxxvi, no. 8, pp. 549–551, 4 refs. Paris, 1928.

The author calls attention to the fact that the foregoing paper confirms his theory that the climate of France is unfavourable to the maintenance of *Plasmodium falciparum* (*praecox*) [*R.A.E.*, B, vi, 105] though it had been disputed.

SÉGUY (E.). **Notes sur les moustiques de l'Afrique mineure, de l'Egypte et de la Syrie. II.**—*Encyc. ent., Sér. B, II, Dipt.*, iv, pt. 1–2, pp. 27–28, 3 refs. Paris, 15th December 1927.

Further notes on distribution and synonymy supplementary to the author's work on the mosquitos of north Africa [*R.A.E.*, B, xii, 113; xiii, 140] are given. *Culex deserticola*, Kirkpatrick, has been recorded from Tunisia as *C. apicalis*, Adams [B, x, 68], and *C. theileri*, Theo., from the south of France as *C. tipuliformis*, Theo. [B, xv, 15].

RODENWALDT (E.). **Kaart en determineertabel van de larven der Anophelinen van Ned. Oost-Indië.** [A Chart and an Identification Table for the Larvae of the Anophelines of the Dutch East Indies.]—2 fldg. diags., 1 fldg. table. Batavia, Dienst der Volksgezondheid [1927?].

This guide for the use of medical officers embodies a key, in the form of a table and two charts, in which the distinguishing characters of the larvae are figured and described. A similar guide to the adults has already been issued [*R.A.E.*, B, xiii, 131].

McHARDY (J. W.). **Report by the Entomologist, Medical and Sanitary Services, Tanganyika Territory.**—*Rep. Med. Lab. Dar-es-Salaam 1926*, pp. 57-74, 1 map, 4 refs. London, 1927.

The results of a mosquito survey of the numerous creeks around Dar-es-Salaam are given. The mosquitos found included: *Anopheles gambiae*, Giles (*costalis*, Theo.), *A. funestus*, Giles, *A. mauritanus*, Grp., and *A. maculipalpis*, Giles, of which the first three are vectors of malaria, though the third is not of any importance; *Aedes (Stegomyia) argenteus*, Poir., which transmits dengue; *Lutzia tigripes*, Grp., the larvae of which were found feeding on those of *A. gambiae*, *A. funestus* and *Culex* spp.; and *C. fatigans*, Wied., which is a vector of filariasis. Small fish that abound in the drains apparently reduce the number of larvae in those parts where they have free access to them, and larvae were absent or much less abundant in pools that contained dragonfly larvae. An experiment was made with a mixture of 1 per cent. by weight of Paris green and wood ash to determine its effectiveness in very densely overgrown breeding places, and the results indicated that it may be used with beneficial effect in situations where oiling would be difficult and of little effect, though owing to its ineffectiveness against pupae and Culicine larvae, oiling is preferable wherever possible. Local drainage problems are discussed, and several suggestions concerning personal precautionary measures, such as screening, are made. It is impossible by treatment of the creeks to prevent individual mosquitos from reaching the town, but since they are more prone to travel when they have a sheltered and shaded passage, it is suggested that many of the densely leaved trees should be removed, particularly those occurring at the edges of the creeks and near houses.

BARBER (M. A.) & KING (C. H.). **The Tadpole of the Spadefoot Toad an Enemy of Mosquito Larvae.**—*Publ. Hlth. Rep.*, xlii, no. 52, pp. 3189-3193, 2 figs., 2 refs. Washington, D.C., 30th December 1927.

In July 1927 in New Mexico the authors noticed that shallow pools in which tadpoles of the spadefoot toad, *Scaphiopus hammondi*, were plentiful were comparatively free from mosquito larvae, while others near contained large numbers. Experimentally it was found that these tadpoles readily ate both Culicine and Anopheline larvae. A pool about 6 yards long by 2 yards wide and 2 inches deep, containing larvae of *Aedes dorsalis*, Mg., was divided into two by a dam, each half containing about 1,000 larvae and 300 pupae. About 100 large tadpoles were placed in one half, and in 36 hours only some 230 larvae and pupae

remained there, although the pool swarmed with crustaceans on which the tadpoles fed freely ; in the other half of the pool the number of mosquito larvae and pupae was unchanged.

The tadpoles of most toads and frogs are herbivorous, and it might be worth while to introduce *S. hammondi*, which is found in the western and south-western States, into localities where it does not at present occur. It is said to breed only in temporary pools, while most Anophelines breed in more permanent waters rich in aquatic vegetation, but Culicines often, and Anophelines sometimes, occur in large numbers in rain-filled pools, and the fact that the toads travel overland is an advantage. The season of *S. hammondi* is usually short and limited to early summer, and it cannot be expected that the tadpoles would be as efficient as certain fish in controlling mosquito larvae, but its propagation, if practicable, could not interfere with any other natural enemy of the larvae.

BALFOUR (M. C.). **Studies on the Bionomics of North American Anophelines. Winter Activities of Anophelines in coastal North Carolina (36° N. lat.).**—*Amer. J. Hyg.*, viii, no. 1, pp. 68-76, 2 charts, 4 refs. Baltimore, Md., January 1928.

The Anophelines found in the part of North Carolina in which these investigations were made are *Anopheles quadrimaculatus*, Say, *A. punctipennis*, Say, and *A. crucians*, Wied., the last-named being relatively rare at all seasons. Collections of larvae were made at intervals of 10 days from 1st November 1926 to 30th April 1927 in each of 80 breeding-places, and the number of larvae to the square metre of water was recorded, this being made possible by the use of a specially designed dipper, together with the temperature of the water. Adult Anophelines were searched for in houses, stables, outbuildings, etc., during the same period, and records of the number caught per man hour were kept. All these data are shown in charts in which rainfall and air temperature observations from the local meteorological station are also included. Water with horizontal or vertical aquatic vegetation produced most larvae, very few being found among debris or in open water ; most of the larvae were found at the surface, and only during one or two very cold spells was it necessary to stir them up from the bottom.

The following is taken from the author's summary : In this area *A. quadrimaculatus* and *A. punctipennis* pass the winter both as larvae and as adults, the adults being apparently the more important, and *A. crucians* as larvae and probably as adults. Larvae survived a ten-day period having a mean minimum temperature of 24° F., and an absolute minimum of 12.5° F. An adverse period of several days during which there were three inches of ice on all breeding-places and another during which there were twenty inches of snow were successfully resisted. In such a winter, which is moderately severe, there is a progressive though retarded development of larvae in the warmer intervals. Larval development and the activity of adults during the winter are directly related to temperature. The wintering larvae survived best in breeding-places such as borrow pits that were not subjected to the scouring effect of rain. Egg-laying by wintering females took place in a warm interval in the middle of February, and the first emergence of adults from wintering larvae late in February, although the numbers of these adults were undoubtedly small. The

second brood, resulting from oviposition by wintering females and adults of the first brood, emerged in the latter part of April. Adults were caught most frequently in stables; a movement of adults from secluded resting places was noted in the warmer intervals of the winter period. Although there were two cold spells in the winter of 1926-27 the mean minimum temperatures for February and March were high compared with those of the previous year, and the oviposition that occurred in February might be much later in other years.

BALFOUR (A.). **Health Lessons from Bermuda.**—*Brit. Med. J.*, no. 3506, pp. 447-448. London, 17th March 1928.

In the Bermudas, fifty years ago, the chigger flea [*Tunga penetrans*] was common, but it has now disappeared. This has not been satisfactorily explained. Malaria also is absent, and Anophelines have never gained a footing, although opportunities must have been frequent in the past for their introduction. The alkalinity of the waters might account for this, but their hydrogen ion concentration has not yet been studied. A fish, *Fundulus bermudae*, keeps down the number of *Culex fatigans* and *Aedes* spp., a natural balance having been established, but the fish and carnivorous Arthropod larvae may have been more successful in exterminating Anophelines. The recent introduction of malaria into Barbados [*R.A.E.*, B, xvi, 119] indicates that the freedom of Bermuda from the disease may not be permanent. Among the mosquitos present is *A. argenteus (aegypti)*. Numerous outbreaks of yellow fever, some of which, however, were probably really typhus, have been recorded in the past, although it is now absent. The fact that the disease never gained a permanent hold in the Colony may possibly be attributable to the unfavourable winter.

Studies of the Malaria Problem in Porto Rico.—*Porto Rico Hlth. Rev.*, ii, no. 12, pp. 25-31. June 1927. (Abstract in *Publ. Hlth. Rep.*, xlii, no. 51, p. 3142. Washington, D.C., 23rd December 1927.)

The breeding of *Anopheles albimanus*, Wied., reaches its greatest intensity during a period of high temperature and rainfall and low wind velocity, while *A. grabhami*, Theo., thrives best during the cooler and drier months. *A. vestitipennis*, D. & K., is intermediate between the two, but seems much more sensitive to heat than either and thrives best at the time when the number of temporary water deposits is greatest. Ditches in sugar-cane fields proved to be excellent breeding-places for *A. albimanus*, particularly when not cleaned out, but high cane and the consequent shade had a very noticeable effect in reducing the amount of breeding.

PERYASSÚ (A. G.). **Prophylaxia da febre amarella no Brasil.** [The Prophylaxis of Yellow Fever in Brazil.]—*Arch. Hyg.*, i, no. 2, pp. 49-86, 5 pls., 2 diagr., 3 maps. Rio de Janeiro, 1927. (With Summaries in French and English.)

This is an account of the occurrence of yellow fever in Brazil and of the measures successfully taken against it, all of which are directed against the breeding-places of *Aedes argenteus*, Poir. (*aegypti*, L.). After the larval index has fallen to 2 per cent., the inspection of breeding-places is continued for another two years.

DEL NEGRO (C.). **O Verde Paris na prophylaxia da malaria.** [Paris Green in the Prophylaxis of Malaria.]—*Arch. Hyg.*, i, no. 2, pp. 143–158, 6 pls. Rio de Janeiro, 1927. (With Summaries in French, English and Italian.)

Experiments in dusting marshy land against Anopheline larvae showed that 1 part of Paris green with 100 parts road dust is an efficient mixture. The Paris green contained only about 40 per cent. arsenious anhydride. While 1·1 bushels was sufficient to cover 1 acre, the uniform distribution of so small a quantity entailed a great loss of time. The larvicidal effect was good with all types of vegetation. In a series of tests the percentages of living Anopheline larvae were 3, 4, 0·8 and 3 per cent. The poison had no effect on the pupae, or on Culicine larvae and other fauna.

Some recent Additions to our Knowledge concerning Malaria, and our Present Plan for its Control.—*15th Rep. Med. Dept. United Fruit Co. 1926*, pp. 25–45, 19 refs. Boston, Mass., 1927.

A number of recent important papers on malaria and its control, particularly that by James and Shute [*R.A.E.*, B, xiv, 176], are extensively quoted, with special reference to their bearing on conditions in the various stations of the United Fruit Company in tropical America.

The present plan for the treatment of the disease and the control of mosquitos in these areas is briefly outlined.

CLARK (H. C.). **Anopheles Mosquitoes in our Tropical Divisions.**—*15th Rep. Med. Dept. United Fruit Co. 1926*, pp. 45–47, 5 refs. Boston, Mass., 1927.

A number of records of the occurrence of Anopheline mosquitos in various countries of Central and South America and the West Indies have been collected as a guide in sanitary work and to supply a readily accessible reference to the Anophelines of the various stations of the United Fruit Company. *Anopheles albimanus*, Wied., is apparently the chief vector of malaria and occurs in all the localities.

PAINTER (R. H.). **The Biology, Immature Stages, and Control of the Sandflies (Biting Ceratopogoninae) at Puerto Castilla, Honduras.**—*15th Rep. Med. Dept. United Fruit Co. 1926*, pp. 245–262, 1 pl., 16 refs. Boston, Mass., 1927.

This report on investigations carried out in Honduras from 1st April to 27th June 1926 is divided into two parts, the first dealing with the general conditions and the habits of the Ceratopogonids, the ecology of the larval habitats and methods of control, and the second giving detailed descriptions of the larvae and pupae of the species reared. In all five species were found, all of which attack man; they are *Culicoides furens*, Poey, *C. phlebotomus*, Will., an undescribed species of *Leptoconops* and two undescribed species of *Culicoides*. The general characteristics of the species dealt with are given to facilitate field determination. *C. furens* is the most obnoxious species in the town of Puerto Castilla; its distribution is at times somewhat erratic, probably depending on various conditions, including humidity and the velocity and direction of the wind. A similar irregular distribution occurs along the beach and in the swamp. Large numbers

of the insects congregate about the leaf-sheaths of palms and other plants that collect water or moisture in the leaf-sheaths. These swarms consist entirely of females; if males are present, it is an indication of a breeding-place near by, as they do not fly far from the point of emergence. The females, however, seem to fly some distance (at least 630 yards) in search of blood. *Leptoconops* sp. and *C. phlebotomus* are rarely found except near their breeding-places.

The larvae of *C. furens* are found along the edges of pools, in soil that consists generally of about three-fourths sand and the rest humus. Occasionally they are found in the bottom of shallow accumulations of water, which is usually, but not always, brackish, and may be sometimes almost wholly sea water. *Leptoconops* sp. usually breeds in the wet area of nearly pure sand just above the high tide level, along the sides of lagoons and of the canal, where there is little or no wave action. *C. phlebotomus* has been reared only from the low, wet depressions along the sand beach, which are very rarely flooded, but are near enough to high-tide level to be continually wet. One of the undescribed species of *Culicoides* was reared from sandy mud taken from beside fresh water and slightly brackish pools; the other from mud containing dead leaves and sticks from along the side of a fresh-water stream.

The remedial measures are discussed; those recommended under local conditions are the establishment of a barrier or non-breeding zone by a combination of flooding and filling over an area extending about half a mile from the canal, which should be exposed to sun and wind; the removal of brush and weeds that at present provide shelter for the adults; the removal and destruction of wet decaying logs, which provide a breeding-place for the larvae; and the filling-in of wet sand flats along the beach. The sides of all canals and lagoons should be made as vertical as possible and treated with a heavy unbroken film of oil, thus rendering them less suitable as breeding-places.

CLARK (H. C.). **Equine Trypanosomiasis in Colombia (Rengera or Derregadera).**—*15th Rep. Med. Dept. United Fruit Co. 1926*, pp. 263–265, 3 refs. Boston, Mass., 1927.

Trypanosomiasis appears to be a serious disease of introduced horses in Colombia; of 127 native horses examined, only 5 per cent. were infected. The native animals are highly resistant; they can survive the acute period of an epidemic and may remain dangerous chronic cases, carrying the disease for many months. The trypanosome is apparently *Trypanosoma hippicum*. *Tabanus importunus*, Wied., is recorded as the vector in Venezuela.

SEAGAR (E. A.). **Malaria in Barbados.**—*Trop. Agriculture*, v, no. 3, pp. 48–50, 2 figs. Trinidad, March 1928.

As a result of the occurrence of a large number of cases of malignant tertian malaria in Barbados, where Anophelines had never previously been found, a search for larvae was undertaken. *Anopheles albimanus*, Wied., was found to be widely distributed. Larvae were numerous in hollows in fields containing water, with grass growing up from the bottom and entangling green algae, but they were also found even in large pools containing small fish provided that the edges were grass-grown. Intensive breeding occurred in grass-grown roadside ditches, which would be an important factor in the spread of the disease.

The importance of organising a definite campaign against the mosquitos and the disease, particularly the control of breeding-places, is pointed out. How long the Anophelines have been in Barbados is not known. It is suggested that they were probably introduced in the holds of small schooners carrying fruit or timber.

BARBER (M. A.). **The Food of Culicine Larvae. Food Organisms in Pure Culture.**—*Publ. Hlth. Rep.*, xliii, no. 1, pp. 11–17, 2 refs. Washington, D.C., 6th January 1928.

These experiments in rearing Culicine larvae in cultures were on the same lines as those with Anophelines [*R.A.E.*, B, xv, 228]. Eggs of *Culex fatigans*, Wied. (*quinquefasciatus*, Say) and *Aedes argenteus*, Poir. (*aegypti*, L.) hatched readily in sterile nutrient media, both acid and alkaline, and those of the former in a medium containing 0·7 per cent. salt. Oxygen appeared to be essential to hatching, but there was no indication that hatching was promoted by bacteria, except possibly in the case of *A. sollicitans*, Wied. The presence of bacteria in heavily contaminated cultures or of a thick growth of infusoria, bacteria or yeasts sown in the cultures did not inhibit hatching. In a large proportion of the cultures eggs of *C. fatigans* and *A. argenteus* hatched within two or three days of the time when they were laid, but only in one or two cases did eggs of *A. sollicitans* hatch in the media in which they were placed to test for sterility; it appears that a resting period of some days favoured the hatching of the eggs of this species, but that a long resting period is not essential.

As with Anophelines, the presence of living food organisms seemed to be necessary for any considerable larval growth to take place, although larvae survived for 12 days or more in sterile broth. Culicines reached maturity in media contaminated with bacteria or inoculated with various living organisms, thriving better than Anophelines in small containers with a rich medium, although larger containers with a less concentrated medium were more favourable. An alga, *Scenedesmus*, and an infusorian, *Colpidium*, used in pure cultures, belonged to the same strains as those used with Anophelines [*loc. cit.*]. Adults of *C. fatigans* were reared from pure cultures of yeast, bacteria and *Scenedesmus*, *C. territans*, Wlk., from cultures of mixed bacteria, and *A. argenteus* from pure cultures of *Colpidium* and *Scenedesmus*. Many adult Culicines were obtained from various mixed and contaminated cultures, a mixture of bacteria and the infusoria, *Colpidium* or *Paramecium*, apparently providing the best medium. The addition of sterilised earth to cultures did not materially promote the growth of the larvae, nor did it prevent the development to maturity of larvae of *A. argenteus*. The success of the cultures did not appear to depend on a close adjustment of the hydrogen-ion concentration. Nearly all cultures were kept at high room temperature, which was found to be more favourable to Culicines than to Anophelines.

BOREL (M.). **Enquête entomologique et épidémiologique à Can-Tho et Bac-Lieu (Cochinchine).**—*Bull. Soc. Path. exot.*, xx, no. 10, pp. 974–976. Paris, 1927.

The towns of Can-Tho and Bac-Lieu, in the rich rice-growing lowlands of Cochin China, are almost free from malaria, and the disease is

comparatively rare in the surrounding country, the rice cultivation having driven out the non-domestic Anophelines, which are the vectors of malaria in the region. At Can-Tho no adult mosquitos were caught, and only a few larvae of *Anopheles* (*Pseudomyzomyia*) *vagus*, Dön., were found. At Bac-Lieu, the immediate vicinity of which is ill-drained, mosquitos were numerous, the commonest being *A. vagus*, which was the only Anopheline found, *Aedes* (*Stegomyia*) *argenteus*, Poir., and *Culex fatigans*, Wied. The rarity of malaria in spite of the abundance of *A. vagus* confirms observations made elsewhere in Cochin-China that this species is of practically no importance in the transmission of the disease.

BOREL (M.) & LE-VAN-AN. **Le paludisme à Saïgon.**—*Bull. Soc. Path. exot.*, xx, no. 10, pp. 994–1004, 3 figs. Paris, 1927.

Details are given of malarial infections among labourers employed in clearing forests in the red soil region in the east of Cochin China, and among patients attending a dispensary in Saïgon. Malaria is endemic in the red soil region [*R.A.E.*, B, xv, 64], and the importation of labour from Tonkin has been attended by a serious epidemic; in 1927 examinations carried out from 21st February to 20th May showed an increase in the monthly percentage of infections among men from 28 to 43, although the percentages among women and children were considerably lower, the percentage for men, women and children for the three months being 29. At the dispensary in Saïgon the percentage of infections during the same period was 7, but in a number of cases the disease was not contracted in the town itself. Among 256 school children examined in the town only a single case was found. All three species of *Plasmodium* occur, *P. malariae* being the least common.

Much the commonest Anopheline at Saïgon is *Anopheles* (*Pseudomyzomyia*) *vagus*, Dön., while *A. barbirostris*, Wulp, and *A. hyrcanus* var. *sinensis*, Wied., are found, particularly on the outskirts of the town, and *A. (Neomyzomyia) tessellatus*, Theo., *A. (N.) kochi*, Dön., and *A. (Neocellia) fuliginosus*, Giles, are much rarer, the last-named being almost entirely a rural species. Very few Anophelines are found in houses of modern European construction that are well lighted and ventilated, and the native straw huts, which they frequent and in which most of the cases of malaria occur, are being gradually replaced by brick or stone houses. The commonest Anophelines feed as readily on animals as on man. *A. vagus* does not apparently exhibit a preference for any particular kind of breeding-place, but *A. barbirostris*, *A. hyrcanus* var. *sinensis*, *A. tessellatus* and *A. fuliginosus* breed in pools in which algae and other plants are abundant. The larvae of *A. kochi* are found almost exclusively in small, shallow and usually muddy collections of water, without vegetation, such as occur in hoof-marks in clay soil.

FLETCHER (W.). **Annual Report of the Institute for Medical Research for the Year 1926.**—*Rep. Med. Dept. F.M.S. 1926*, pp. 31–52. Kuala Lumpur, 1927.

Notes and observations are given on tsutsugamushi disease, owing to its recent occurrence in Malaya [*R.A.E.*, B, xvi, 47, 101]. The most effective way of dealing with a nidus of infection on an estate appears to be by clearing away the weeds and undergrowth in which rats

live. The labourers should have their bodies smeared with some repellent such as citronella oil and sulphur ointment or with naphthalene paste. A mixture of cajeput and tobacco juice has also been recommended. The body and clothes should be washed immediately on leaving the infected area, the clothes being soaked for 30 minutes in 2 per cent. lysol or izal. It has been stated that the onset of the disease may be prevented by excising the part of the skin where the mite is found or by extracting the larva with a needle.

Though tropical typhus [R.A.E., B, xv, 43] has many points in common with tsutsugamushi disease, the author considers that it is undoubtedly distinct.

PENDLEBURY (H. M.). **Annual Report of the Malaria Bureau for the Year 1926.**—*Rep. Med. Dept. F.M.S. 1926*, pp. 53–55. Kuala Lumpur, 1927.

Mosquito surveys made in the rice fields of Negri Sembilan at different periods of the year showed that *Anopheles fuliginosus*, Giles, was always present, often in large numbers, and it seems probable that it breeds there throughout the year. On the other hand *A. aconitus*, Dön., is present just before and during the harvest, but its numbers decrease during the fallow season and it disappears entirely before the seedlings are transplanted to the rice fields; it reappears when the rice is about four months old and the water in the rice fields becomes clear owing to the fresh supplies from irrigation channels or adjacent streams.

Laboratory tests indicated that rubber oil was a more efficient larvicide than solar or crude oil, but that it lost much of its efficacy when exposed in a thin layer to the air for a period of 17 hours or more. Experiments with mixtures of rubber and solar or rubber and crude oils in varying proportions showed that they are not more toxic than the components alone until the proportion of rubber oil reaches 50 per cent. The tendency of rubber oil to produce thin, inefficient films probably renders it unsuitable for use on the margins of large ponds or in other places where the expanse of water is not limited, but it may prove very efficient if sprayed heavily on pools or small accumulations of water.

IYENGAR (M. O. T.). **Report on a Mosquito Survey of certain Tea Estates in the Bengal Duars.**—*Govt. Bengal, Publ. Hlth. Dept. Rep. Malaria Surv. Jalpaiguri Duars*, pp. 57–67. Calcutta, 1926.

In order to make a comparative study of conditions regarding the prevalence of Anopheline mosquitos in the different zones of the Bengal Duars, an extensive survey was carried out during August and September 1925 of certain tea estates situated in the sub-montane region of the eastern Himalayas, and of one tea garden in the plains outside the sub-montane region. The important breeding-places for mosquitos in this area are the streams that run continuously during the rainy season. These streams carry water that seeps from the soil as well as storm water. On estates situated at a high level they start to flow late and dry up early, the period during which they run increasing as the altitude decreases until in the lower estates they contain

water throughout the year. The mosquitos breed practically all the year round in these perennial streams, with an increase during the rainy season. The number of larvae found depends to a large extent on the velocity of the water and the amount of aquatic vegetation present, the most suitable streams for breeding purposes being those with a gentle current and vegetation at the sides as well as in the middle. While the larvae are able to withstand a moderately strong current, they cannot survive a fast and continuous rush of water, and their numbers are greatly reduced after a heavy downpour of rain on consecutive days. They are, however, able to evade a single sudden flush of water, such as that from the experimental flushing weir employed on one of the estates. The rice plots in and near the tea gardens are next in importance as breeding grounds. They are usually terraced and watered by some small stream that circulates continuously from the higher to the lower plots. Breeding also occurs where water oozes from the soil as seepages. Eleven species of *Anopheles* were observed: *A. subpictus*, Grassi (rossi, Giles), which breeds principally in stagnant water, in ditches and newly made borrow pits containing turbid water; *A. barbirostris*, Wulp, and *A. hyrcanus* var. *sinensis*, Wied., which were collected from slow-running and stagnant streams; *A. maculatus*, Theo., and *A. minimus*, Theo., which are principally found in streams, but also breed freely in terraced rice fields; *A. culicifacies*, Giles, which breeds in slow-running streams; *A. fuliginosus*, Giles, which occurred in pools by the side of streams, in ponds, in rice plots, in the older borrow pits, and frequently in slow-running streams; *A. karwari*, James, which usually breeds in seepages and seepage pools; *A. aitkeni*, James, and *A. leucosphyrus*, Dön., both in the forest, the former in streams entirely shaded from the sun and the latter in water in the foot-prints of elephants; and *A. jamesi*, Theo., which was only found on one estate. In the highest gardens, *A. maculatus* predominates, below this region *A. minimus* and *A. culicifacies* are the most common species, in the lower zone *A. fuliginosus* is most prevalent, while in the garden on the plains *A. hyrcanus* var. *sinensis* is the most abundant and *A. fuliginosus* comes next.

Conditions in the individual estates are discussed, and it is apparent that anti-mosquito measures, in order to be effective, must vary with local conditions. The survey clearly demonstrates that where measures such as various types of drainage, the clearing of vegetation and oiling have been carried out, mosquito breeding is greatly reduced, and it is pointed out that still further benefit would be derived from these measures if they were undertaken co-operatively by all estates so that the migration of mosquitos from untreated neighbouring gardens would be prevented.

SERGEANT (Edm. & Et.), CATANEI (A.) & SENEVET (G.). **Monographies des localités dénoncées comme palustres en Algérie. Troisième série. Etudes épidémiologiques et prophylactiques du paludisme en 1925-1926.** -Arch. Inst. Pasteur Algérie, v, no. 2, pp. 131-160, 11 figs. Algiers, June 1927.

This is the third of a series of reports on malarious localities in Algeria (cf. R.A.E., B, xii, 109; xiv, 106). The breeding-places of Anophelines in each locality are briefly discussed and methods of dealing with them are suggested.

SERGEANT (Edm.), DONATIEN (A.), PARROT (L.), LESTOQUARD (F.) & PLANTUREUX (E.). **Les theilrioses bovines. Etude comparative de *Theileria parva* de l'Afrique du Sud et de *Theileria dispar* de l'Afrique du Nord.**—*Arch. Inst. Pasteur Algérie*, v, no. 2, pp. 161–187, 5 figs., 7 refs. Algiers, June 1927.

An abridged version of this paper has already been noticed [*R.A.E.* B, xv, 195]. Additional matter on experiments with the tick *Rhipicephalus appendiculatus*, Neum., obtained from South Africa, includes details of two unsuccessful attempts to transmit *Theileria dispar* to calves by nymphs fed as larvae on calves infected with Mediterranean coast fever, and notes on the development of *R. appendiculatus* in North Africa. The duration of the stages of the ticks was little affected by the fact that development was continuous through two consecutive summers (in South and North Africa) without an intervening winter.

INGRAM (A.) & DE MEILLON (B.). **A Mosquito Survey of Certain Parts of South Africa, with Special Reference to the Carriers of Malaria and their Control. Part I.**—*Pub. S. Afr. Inst. Med. Res.*, no. 22, pp. 1–81, 53 figs., 41 refs. Johannesburg, October 1927.

With the exception of a few surveys and reports of recent years, very little has been recorded of the mosquito fauna of the Union of South Africa, practically no studies having been made in the Orange Free State or in large tracts of Cape Province and the northern Transvaal. The South African Institute for Medical Research has therefore undertaken a survey of the malarious parts of the Union, of which the present is the preliminary report. An account is given of the various districts of the northern Transvaal visited, former records of malaria in that region being reviewed. Adult mosquitos were collected when seen, but the majority of Anophelines obtained were reared from larvae. Those found in the northern Transvaal include *Anopheles mauritanicus*, Grp., *A. squamosus*, Theo., *A. gambiae*, Giles (*costalis*, Theo.), *A. pretoriensis*, Theo., *A. rufipes*, Gough, *A. funestus*, Giles, *A. natalensis*, Hill & Haydon, *A. transvaalensis*, Cart., *A. maculipalpis*, Giles, *A. longipalpis*, Theo., *A. rhodesiensis*, Theo., *A. theileri*, Edw., and *A. cinereus*, Theo. The distribution and habitat of each of these is discussed, and a list is given of the Culicines collected and of the places where their larvae were found. Certain measures are suggested for the reduction of the breeding-places of Anopheline larvae at the various sites visited. There are reasons for thinking that *A. gambiae* and *A. funestus* are the principal carriers of malaria in the northern Transvaal, as they are in Zululand and in most parts of the Ethiopian region that are malarious, yet it is difficult to explain their apparently complete absence from certain localities at times and their presence in the same localities at other times in large numbers; the probability is that they persist in localities from which they are supposed to have disappeared, but in such small numbers that they are overlooked. In one locality, *A. gambiae* is reported as sometimes being absent from collections for 3 or 4 years in succession, after which it reappears; it would be interesting to know whether its reappearance coincides with years of heavy rainfall and of epidemic malaria. Further data on

these species as possible malaria carriers are required ; it is important to determine their occurrence in other parts of the northern Transvaal that are malarious and to discover where they hibernate, as neither species seems to enter dwellings for this purpose. It is possible that *A. maculipalpis* may also prove to be a malaria carrier in Africa, as in India, but it is probably too rare to be of much importance in this respect.

The general measures suggested for the prevention of malaria in the northern Transvaal include the segregation of native employees, who act as reservoirs of infection ; the removal of dwelling houses to a distance of at least half a mile from streams and rivers ; screening of houses ; the education of children regarding malaria infection ; the canalisation of all small streams within a mile radius of dwellings ; and the clearing of vegetation giving shade at the edges of rivers and streams to mosquito larvae or mosquitos within the same distance from houses.

A survey was also made of the coastal belt of Zululand, where the physical conditions in regard to malaria and the average rainfall are discussed and an account is given of the districts visited. The mosquitos taken or reared from larvae in this region are enumerated ; they include all the Anophelines mentioned above in the northern Transvaal, except the last three, and also *A. ardensis*, Theo., and *A. phuroensis*, Theo. Notes are given on the preferred habitats of these species. From the larvae examined and the adults reared from them, it is concluded that *A. aureosquamiger*, Theo., is synonymous with *A. natalensis*, while the species listed as *A. longipalpis* may be merely a variety of *A. funestus*, as it was found impossible to separate the larvae, and the male genitalia also resemble each other closely. *A. gambiae* and *A. funestus* are the two species associated with malaria in Zululand ; the former is by far the more numerous and is probably the chief malaria carrier in the coastal belt. The preventive measures suggested are similar to those enumerated above. The pools formed in the beds of rivers alongside the main stream when it subsides are frequently breeding-places of *A. gambiae* and require attention in the vicinity of bridges during construction or where there are houses near the banks ; it should be easy to drain them into the main stream. *A. funestus* was not found at the edges of large rivers, but seemed to prefer small rivers and streams where the water was clearer and the shade deeper. It is suggested that no dwelling should be erected until the site has been passed as suitable by the sanitary authority. Houses should be built with wide verandahs and native huts should be erected at least half a mile to leeward of the dwellings of Europeans. The killing of engorged mosquitos in houses is recommended ; natives can be trained to do this in the native huts.

It was stated by MacGregor (*R.A.E.*, B, xii, 79) that the discharges from sugar mills have a larvicidal effect, but that they are inadvisable as larvicides on account of their unpleasant odour ; it is hoped, however, that further investigations with rotting sugar-cane may result in the discovery of a cheap and odourless larvicide. Larvae were not found in water containing an odourless brown sediment associated with rotting cane from a neighbouring mill.

Descriptions are given of new mosquitos collected in Zululand and of the larvae and pupae, not hitherto described, of certain other mosquitos.

SYMES (C. B.). **Key to the Identification of Common Anophelines of Kenya.**—*Kenya & E. Afr. Med. J.*, iv, no. 9, pp. 281–286, 12 pls. Nairobi, December 1927.

This key to the fourth stage larvae of the Anophelines of Kenya is based on the external characters and includes the following species: *Anopheles christyi*, Newst. & Cart., *A. mauritanus*, Grp., *A. gambiae*, Giles (*costalis*, Theo.), *A. transvaalensis*, Cart., *A. implexus*, Theo., *A. pharoensis*, Theo., *A. squamosus*, Theo., *A. cinereus*, Theo., *A. pretoriensis*, Theo., *A. funestus*, Giles, and *A. maculipalpis*, Giles. An additional key to adult Anophelines, given as an aid to making provisional identifications in the field, also includes *A. rufipes*, Gough, and *A. aureosquamiger*, Theo.

[SYMES (C. B.).] **Section of Medical Entomology.**—*Rep. Med. Res. Lab., Kenya 1926*, pp. 23–28. Nairobi [1927].

Microscopical examination of some 200 slides of the stomach contents of *Glossina palpalis*, R.-D., from the shore of Lake Victoria showed that 35 per cent. contained mammalian blood. By the precipitin method human blood was found to be present in 38 out of 154 smears tested.

Mosquito surveys were carried out in several areas, and in all cases *Anopheles gambiae*, Giles (*costalis*, Theo.) was found to occur in very large numbers during and after the long rains; this species breeds in open, stagnant pools, excavations such as borrow pits and irrigation canals, natural depressions, and pools left by the partial drying-up of rivers, the majority of these breeding-places, especially in and near townships, being man-made. In 1926 the season of *A. gambiae* coincided with that of the highest incidence of malignant tertian malaria; during the malaria epidemic from April to July, 95 per cent. of the adult mosquitos captured in Nairobi were *A. gambiae*, and of 338 taken in native quarters two showed oocysts and two active sporozoites. In Nairobi and the other districts so far investigated, *A. gambiae* has been pre-eminently the domestic Anopheline from March to September, its place being taken during the remaining months by *A. christyi*, N. & C., and *A. funestus*, Giles, which have, however, occurred only in very small numbers. *A. funestus*, *A. transvaalensis*, Cart., and *A. rhodesiensis*, Theo., have been so rarely taken in dwellings that data are insufficient to warrant any conclusions as to their influence on malaria incidence. At Kisumu, *A. funestus* was very abundant during the last five months of the year, and oocysts were found in two specimens caught wild, but the large numbers of this species appear to have affected the malaria incidence very little. Papyrus swamps are usually the breeding-places of *A. mauritanus*, Grp., and *A. maculipalpis*, Giles, with a few *A. funestus* along the edges, and are not suitable for *A. gambiae* until attempts at reclamation have been made. A very great reduction in the incidence of malaria would be brought about by the elimination of *A. gambiae*; at Nairobi and Kisumu this would require considerable expenditure, but in the smaller townships little expense need be incurred if care is exercised in the construction of roads; the natural breeding-places of *A. gambiae*, small open pools in swamps and drying streams, can frequently be rendered innocuous with very little trouble. At Kisumu, attempts

to drain the papyrus and reed swamps along the lake shore, where *A. pharoensis*, Theo., *A. mauritanus* and *A. maculipalpis* breed in considerable numbers, have resulted in increasing the breeding-places of *A. gambiae*, and it is recommended that the lake shore should remain untouched, with as few open drains as possible.

Observations have been made on the longevity of *Ornithodoros moubata*, Murr., in captivity. Larvae obtained from eggs were isolated without having fed, some in damp sand and some in pill boxes, on 27th February 1926; nearly all were still alive and active on 29th January 1927. Adults from which the eggs were obtained lived without food for ten months after oviposition, while one female that had apparently not been fertilised was still alive and active after 13 months.

Nearly 5,000 rat fleas from various localities were identified during the year. Both *Xenopsylla cheopis*, Roths., and *X. brasiliensis*, Baker, appear to be associated with plague. On *Mus (Rattus) rattus kijabius*, the prevalent rat in all the areas investigated, *X. brasiliensis* is the flea of native villages and huts, while *X. cheopis* predominates in towns and in the more permanent types of buildings. There is some evidence, though insufficient, of a definite rise in numbers of both *X. cheopis* and *X. brasiliensis* during the drier months, December to February and June to October, coinciding to an appreciable extent with the occurrence of plague. *Dinopsyllus lyplus*, J. & R., and *Ctenophthalmus cabirus*, J. & R., are essentially parasites of *Arvicanthis* sp., though the former occurs frequently on *M. rattus kijabius*.

GARNHAM (P. C. C.). **Fleas in Hides and Cotton-seed.**—*Kenya & E. Afr. Med. J.*, iv, no. 9, pp. 287–290, 1 ref. Nairobi, December 1927.

Investigations of hides and cotton-seed carried out from August 1926 to July 1927 in Kisumu, which is a receiving depot for such produce from a wide area including Tanganyika and all parts of Uganda, showed that these articles are liable to harbour fleas, with and without rodent hosts, the invasion being proved to have taken place outside the town. The majority of the fleas found in cotton-seed were *Xenopsylla cheopis*, Roths., while most of those contained in hides were *X. brasiliensis*, Baker. This distribution corresponds with the prevalence of the latter in native huts from which hides are derived but never cotton-seed; and with the preponderance of the former in ships, bazaars and storage sheds. About 75 per cent. of the hides, most of which were fouled with the excrement of rats, were from cattle. No fleas were found in hides previously treated with naphthol. Examination of bags of cotton-seed from Uganda showed infestation at the rate of 11.5 fleas to 100 bags, the majority showing faecal contamination from rats. The possibilities of plague production are indicated by the fact that 60 per cent. of the fleas obtained from rats in Kisumu were *X. cheopis* and 36 per cent. *X. brasiliensis*, while flea-infested articles, such as cotton-seed and hides, are rapidly transferred into the town from plague areas outside where rats are known to suffer from the disease, a small epizootic having occurred at one point in February 1926. An appreciable number of both hides and bags containing cotton-seed were found to be infested by fleas

unaccompanied by rats, and these are occasionally carried on the heads of natives, whom the fleas might attack in the absence of their natural hosts.

YOUNG (W. A.). **Annual Report of the Medical Research Institute, Accra, from April 1st 1925 to March 31st 1926.**—*Rep. Med. & Sanit. Dept. Gold Coast 1925-26*, pp. 38-50. Accra [1927].

This report includes a summary of the third report on tsetse-fly conditions in the Gold Coast, which has been noticed previously [*R.A.E.*, B, xv, 37]. A brief summary is also given of observations on tsetse-flies made in the course of visits to two districts in the southern and south-eastern parts of the Colony. Three well-marked fly belts were found, in which the chief species were *Glossina longipalpis*, Wied., and *G. palpalis*, R.-D. Other species taken were *G. pallicera*, Big., *G. fusca*, Wlk., and *G. nigrofusca*, Newst., which are recorded as biting at night. *G. pallicera* was unexpectedly common in one area, and had an exceptionally severe bite; twenty specimens of this fly were dissected, but no trypanosomes were found.

PAPERS NOTICED BY TITLE ONLY.

NITZULESCU (V.). **Contribution à l'étude de l'appareil buccal et de la pompe salivaire chez les insectes.**—*Bull. Soc. Path. exot.*, xx, no. 10, pp. 980-986, 6 figs., 4 refs. Paris, 1927.

SELLARS (A. W.). **La lutte contre la fièvre jaune.** [Observations on *Leptospira icteroides* and *L. icterohaemorrhagiae* in *Aedes argenteus*, Poir.]—*Bull. Soc. Path. exot.*, xxi, no. 1, pp. 70-73, 5 refs. Paris, 1928. [Cf. *R.A.E.*, B, xvi, 62.]

DYAR (H. G.) & NÚÑEZ TOVAR (M.). **Descriptions of new Species of Mosquitoes from Venezuela.**—*Amer. J. Hyg.*, viii, no. 1, pp. 89-92. Baltimore, Md., January 1928.

WALCH (E.) & SOESILO (R.). **Malaria in Tegal.**—*Geneesk. Tijdschr. Ned.-Ind.*, lxxvii, no. 6, pp. 777-823, 4 pls., 5 figs. Weltevreden, 1927. [Cf. *R.A.E.*, B, xv, 155.]

BERLESE (A.). **La distruzione della mosca domestica.** [The Destruction of *Musca domestica*.]—*Redia*, xvi, no. 1-2, pp. 1-11, 3 figs. Florence, 1927. [Cf. *R.A.E.*, B, xiv, 172.]

FERRIS (G. F.). **The Larva of *Olfersia vulturis* Van der Wulp. (Diptera: Hippoboscidae).**—*Ent. News*, xxxix, no. 2, pp. 36-37, 1 fig. Philadelphia, Pa., February 1928.

TITSCHACK (E.). **Der Fühlernerv der Bettwanze, *Cimex lectularius* L., und sein zentrales Endgebiet. Gleichzeitig ein Beitrag zur Kenntnis der Wirkung der Fühleramputation.** [The Nerve of the Antenna of *C. lectularius* and its terminal Part. With a Contribution to the Knowledge of the Effect of Antenna Amputation.]—*Zool. Jahrb.*, Abt. allgem. Zool., xlv, Festchr. Hesse, pp. 437-462, 11 figs., 33 refs. Jena, 1928.

ANDRÉ (M.). **Contribution à l'étude des acariens libres. Thrombidiidae de la faune française.**—*Bull. Soc. zool. Fr.*, li, no. 3, pp. 175-228, 11 figs., refs. Paris, 30th June 1926.

HARRIS (R. H. T. P.). **Tsetse Fly Investigations in Zululand.**—*Sci. Bull.* [*Dept. Agric. S. Afr.*], no. 62, 19 pp. [Pretoria, 1927.]

This is a summary of an unpublished report on the tsetse-fly investigations carried out in the Empangeni district of Zululand from 1920 to 1927 on the lines suggested by the Imperial Bureau of Entomology [*R.A.E.*, B, ix, 54, 46]. The tsetse-flies recorded are *Glossina pallidipes*, Aust., which is by far the commoner, and is the species dealt with in this paper, and *G. brevipalpis*, Newst., which occurs where the rivers and lakes are fringed with a heavier type of bush that intermingles with large trees and supplies denser shade conditions than are found in the low bush savannah. No evidence of the existence of *G. austeni*, Newst., in Zululand other than the capture of a single specimen at Ubombo [B, iv, 121] has been obtained.

Some of the author's experiments with dummy animals for attracting *G. pallidipes* and on the range of flight of the fly have already been noticed [B, xiii, 192; xv, 118, etc.]. The author considers that direct sunlight and humidity are not essential to the pupae, but that the transformation to the adult is dependent on temperature, and that the frequent failure of pupae in places not reached by the sun to produce adults is due to the absence of temperature changes that sunlight would produce. The adults may live for six months. No evidence was obtained that they take any food other than the blood of vertebrates. The presence of starch grains in the gut is not taken as any indication that the flies feed on vegetable matter; the author repeatedly observed flies probing the horizontal trunk of a fallen tree, and he suggests that some of the sap of the tree containing starch grains might be taken into the gut with the saliva that is pumped up as well as down. Food is found by sight, but an animal is not recognised as a source of food when seen; the flies wander along the open spaces in the bush and alight on horizontal masses, either animate or inanimate, that are conspicuous by contrast with the surroundings. The direction of flight is dependent on shadows and the stimulus of conspicuous objects in the line of vision. The features of light and shadow are especially pronounced along game trails in the bush and generally where game animals are likely to occur. The retreat of the fly in the winter months is also due to its instinct to make for shadow lines, which keeps it chiefly among leafy bush. As cover elsewhere fails, many wild animals also tend to retire to the denser bush of the valleys, so that the association of the fly with its food supply is maintained. The author concludes that *G. pallidipes* is dependent for its existence on a widespread as well as plentiful supply of animals to which it is attracted, throughout the area over which its reaction to shadow causes it to roam. Small animals are naturally less likely to be located than large ones, and animals with inconspicuous outlines, such as zebra, are likely to pass unnoticed, while any animal may be overlooked on cloudy days.

The position normally obtaining in Zululand is that the country where *G. pallidipes* occurs may be considered as comprising three zones: the occupied farms, where trypanosomiasis of cattle sometimes occurs, though the fly is generally absent and always rare; the unoccupied land between the farms and the game country, where the fly occurs sparsely but constantly; and the bush area, in which wild animals, through protection, are numerous and well distributed and fly is permanent and abundant. In the second zone shooting of game is allowed, and this causes such an erratic distribution of the

fly's food supply that the author considers that it would soon die out if not reinforced from the bush zone. In times of prolonged drought the normal distribution of game is greatly disturbed and the animals approach the occupied zone in search of pasture and water; as a result of this the distinction between the second and third zones largely disappears as regards the fly, and the danger of domestic animals becoming infected is greatly increased. If it were possible to confine the game within the reserves, the fly would almost certainly be prevented from reaching the present settlements, but there would always be the danger of the animals breaking bounds under seasonal stress. In the author's opinion the only general means of controlling tsetse-fly worthy of adoption is the thinning out of game beyond the point at which it can support the fly. No kind of wild animal need be exterminated, but there must be a diminution in numbers, particularly of the larger species, so that the fly must wander so long in search of food that it can no longer perpetuate itself. The diminution of game should be carried out cautiously, under skilled supervision, and according to a carefully prepared plan. Fencing, burning and clearing are of some value, but only for use on a small scale to keep fly away from certain restricted areas. It is assumed that clearing that causes a rise of ground to cut off entirely the view from bush to bush is effective.

TANGANYIKA TERRITORY. Annual Medical and Sanitary Report for the Year ending 31st December, 1926.—155 pp. London, 1927.

The report of the medical officer of health for Dar-es-Salaam (A. McKenzie) deals chiefly with malaria. Owing to unusually heavy rains, mosquito breeding during 1926 was excessive. A large area of swampy land was reclaimed and a new and successful oiling system was instituted, using a mixture of crude road oil, kerosene and castor oil in the proportion 4 : 1 : 1-40. The results of oiling and the records of mosquito inspection are shown in charts. In one district, fresh water prawns were observed to reduce the breeding of larvae to a minimum; further experiments are in progress. A species that is apparently *Anopheles maculipalpis*, Giles, which has not been recorded since 1919, was bred from larvae. *Aedes argenteus*, Poir., the vector of dengue, was numerous.

Sleeping sickness, which is reported upon by G. Maclean, occurs in five separate areas in Tanganyika Territory (which are defined); in the Tanganyika Lake Shore Area the trypanosome is probably *Trypanosoma gambiense* and the vector *Glossina palpalis*, R.-D. (subsp. *fuscipes*, Newst.); in all the other areas the trypanosome is *T. rhodesiense*, and the vector *G. morsitans*, Westw., except in the Maswa-Ikoma region, where it is *G. swynnertoni*, Aust. On the areas of Lake Victoria where *G. palpalis* occurs, and where German workers recorded over 1,000 cases in 1908-09 and 27 cases in 1912-13, none has as yet been recorded by British medical officers. In at least two of the areas where the parasite is *T. rhodesiense*, there is no evidence to suggest that there is any vertebrate host other than man. The preventive measures consist chiefly in sterilising the peripheral blood of infected cases, reducing the contact between man and the tsetse-fly and controlling the movements of natives in infected areas. With regard to the second, in areas infested with *G. morsitans*, it is not always advisable to move people from the forest to open country; so long as the forest exists there must be a certain proportion of the population living near

it. Scrub harbouring tsetse generally invades abandoned arable land, and its advance is only checked by clearing and cultivation. For this reason people removed from infested areas have frequently been settled of recent years in clearings made on the edge of forest or in a large clearing in the forest itself. This is an attempt not merely to remove their homes from contact with tsetse-fly, but also to re-organise the mode of life of forest communities ; it is hoped gradually to introduce bee-keeping and modern methods of agriculture instead of excursions into the forest for wild honey, hunting, etc., and transport of produce through infested forest by motor rather than by porters is encouraged. In the areas harbouring *G. palpalis*, bush is cleared round all the main villages on Lake Tanganyika and similar clearings are being made on Lake Victoria ; clearing, however, is not an absolute safeguard, as the natives fish all along uninhabited parts of the coast and *G. palpalis* will fly at least 50 yards from the shore to a canoe. The treatment for both forms of the disease is explained, and the situation in the respective areas is discussed in detail.

MCCALL (F. J.). **Tsetse Fly and Trypanosomiasis.**—*Rep. Dept. Vet. Sci. & Anim. Husb. Tanganyika Territory 1926*, pp. 10-14. London, 1928.

The results of the work of the Tsetse Reclamation and Game Preservation Department are encouraging, but in one locality where it was thought *Glossina* had been banished by bush burning, numbers were caught again after a few months and the native cattle began to die of trypanosomiasis. It can now be definitely stated that most cases of trypanosomiasis in cattle can be cured with tartar emetic if the disease is dealt with soon enough and abundant cattle food is available. In experiments with inoculation, six sheep and six goats were inoculated with the blood of cattle infected with *Trypanosoma congolense* and *T. vivax*, and were herded apart in the open, receiving no treatment ; one sheep and one goat died before the 20th day, but the rest recovered, and sub-inoculations into calves and other sheep and goats after six months were negative.

A small herd of cattle, the survivors of a number brought into a dense fly area, seem to be immune from the disease ; numbers of flies were caught, all of which were *Glossina morsitans*.

The part played by *Stomoxys* in transmitting both *T. vivax* and *T. congolense*, in areas where *Glossina* is of little importance, is emphasised. It is suggested that since it is impossible to eliminate the flies they should be protected from infection by the immediate removal of infected animals, and in the lower, moist regions the provision of fly-proof houses for the cattle is essential. It has been noticed that while the active native cattle appear able to keep themselves comparatively free from the attacks of *Stomoxys*, imported bulls, especially of the heavier type, suffer severely from these flies.

HORNBY (H. E.). **Oestrus ovis Infection.**—*Rep. Dept. Vet. Sci. & Anim. Husb. Tanganyika Territory 1926*, p. 47. London, 1928.

In one locality nearly every sheep was infested by *Cephalomyia* (*Oestrus*) *ovis*, L., and it is thought that the loss of condition due to pain, dyspnoea and the huddling together of the sheep must be very great indeed. The frontal bones of a few infested sheep were trephined, but it was decided that this operation, followed by flushing

with a fluid such as turpentine, could never become a popular remedy ; the author intends using tar on the sides of the feeding boxes to see if enough will be transferred to the noses of the sheep to prevent infestation.

GRANOUILLET, KHOAN & THU. **Contribution à l'étude clinique, anatomo-pathologique, épidémiologique de la trypanosomiase des chevaux d'Annam.**—*Rev. vét. & J. Méd. vét.*, lxxx, pp. 1-19, 1 chart. Toulouse, January 1928.

An account is given of the symptoms, pathological anatomy and epidemiology of trypanosomiasis of horses, due to *Trypanosoma annamense*, based on observations made in Cochin China, together with a detailed clinical record of one case. Tabanids are particularly abundant in two months of the dry season (March and April), and it is at this time that epizootics occur, the infection spreading further than in the wet season, presumably because the Tabanids have to travel further in search of suitable places for oviposition. Cattle, when the disease is fatal, seem generally to become infected at the end of the wet season or the beginning of the dry season, but the cattle of Indo-China are, as a rule, resistant. The buffalo and certain wild bovines of the forests are the reservoirs of the trypanosome, and the infection may be transmitted, by Tabanids or *Stomoxys*, from them to cattle and from cattle to equines at any time of year. It is suggested that the virulence of the trypanosome is increased by passage through cattle, as it is invariably fatal to equines.

KELSALL (R.). **A Case of sweating Blood.**—*Ind. Med. Gaz.*, lxii, no. 10, pp. 565-566, 1 ref. Calcutta, October 1927.

TURKHUDD (D. A.). **A Case of sweating Blood.**—*Op. cit.*, lxiii, no. 1, p. 51, 3 figs. January 1928.

In the first paper a case is recorded of parasitism of a woman at Rangoon by fleas that burrowed under the skin, and a note by Major G. G. Jolly states that the fleas were *Echidnophaga gallinacea*, Westw., with which fowls kept by the woman as pets in her house were infested. In the second paper the author states that he believes this to be the first recorded case of parasitism of man by *E. gallinacea* in India, although this flea appears to be widely distributed on fowls and often occurs in large numbers in living-rooms in which fowls are kept. He does not think that *Tunga (Dermatophilus) penetrans*, L., has so far been reported as endemic in any part of India, and as *E. gallinacea* is likely to be mistaken for this species, he illustrates and briefly describes characters by which they may be distinguished. *E. gallinacea* may be trapped by letting a guineapig loose in the infested place and then chloroforming it.

SANDERS (D. A.). **Manson's Eyeworm of Poultry.**—*J. Amer. Vet. Med. Ass.*, lxxii (N.S. xxv), no. 5, pp. 568-584, 3 figs., 8 refs. Detroit, Mich., February 1928.

Details are given of experiments carried out in southern Florida on the infestation of fowls by the Nematode, *Oxyuris mansoni*, showing that *Pycnoscelus (Leucophaea) surinamensis*, L., is the intermediate host. The author's observations confirm those of Fielding

[*R.A.E.*, B, xv, 77 ; xvi, 102] in almost every particular. He did not determine whether it is the eggs or the larvae that are ingested by the cockroach nor how the larval worms reach its body cavity. Pigeons and various wild birds have been found to be infected and may therefore act as reservoirs.

MILLER (D. F.). **A Case of the Botfly (*Bogeria buccata*) as a Parasite upon the Common House Mouse (*Mus musculus*).** (*Dipt. : Oestridae.*)—*Ent. News*, xxxix, no. 1, pp. 13-15, 3 refs. Philadelphia, Pa., January 1928.

The author records the occurrence of a larva of *Bogeria buccata*, F. in a mouse, *Mus musculus*, in Ohio. The mouse died shortly before the larva left it. Pupation took place in the earth about 30th September 1926, and the fly emerged on 4th March 1927, the pot containing the pupa having been kept in a warm room. Other cases of the parasitism of mice by Oestrids are reviewed.

LARROUSSE (F.), KING (A. G.) & WOLBACH (S. B.). **The Overwintering in Massachusetts of *Ixodiphagus caucurtei*.**—*Science*, lxvii, no. 1735, pp. 351-353, 6 refs. New York, N.Y., 30th March 1928.

The Chalcid, *Ixodiphagus caucurtei*, du Buysson, was found to be able to survive the winter under natural conditions, and to reproduce, on the island of Naushon, near Woods Hole, where it was introduced from France for the control of the dog tick, *Dermacentor variabilis*, Say [*R.A.E.*, B, xv, 216]. This tick, the natural host of the larvae and nymphs of which was found to be the field mouse, *Microtus pennsylvanicus*, proved to be readily parasitised by the Chalcid, as also was *Ixodes scapularis*, Say, which is found in great numbers on the island. The normal host of the larvae and nymphs of this tick was found to be *Peromyscus leucopus* (white-footed wood-mouse), but both larvae and nymphs readily attached themselves to rabbits and guineapigs. *Rhipicephalus sanguineus*, Latr., and *Haemaphysalis leporis-palustris*, Pack., were also found on the island. Nymphs of *D. variabilis* on rabbits became parasitised in the field by Chalcids liberated at distances of 50 and 100 yds., the greatest distances tried. To introduce the parasites, large numbers of them were liberated where nymphs of *I. scapularis* or *D. variabilis* were numerous; parasitised nymphs of *I. scapularis* were returned to their original situations, mouse-holes, etc.; and domestic and field mice, with parasitised nymphs still attached, were liberated. A year after the introduction of the parasite, a reduction in the numbers of ticks on both wild and domestic animals was noticeable. It is perhaps premature to attribute this to the parasite alone, but it was observed that the decrease of ticks on the island contrasted strongly with conditions on the mainland, Cape Cod, where they were unusually numerous. The influence of climatic conditions may therefore be excluded.

PERRY (J. C.). **Tularaemia among Meadow Mice (*Microtus californicus aestuarinus*) in California.**—*Publ. Hlth. Rep.*, xliii, no. 5, pp. 260-263, 1 ref. Washington, D.C., 3rd February 1928.

A disease that caused the death of a large number of meadow mice (*Microtus californicus aestuarinus*) in a district in central California was

proved by laboratory investigations to be tularaemia. *Bacterium tularensis* has not previously been isolated from naturally infected wild mice. Meadow mice harbour mites, and it is probable that these transmit the disease from mouse to mouse.

IMES (M.). **Cattle Scab and Methods of Control and Eradication.**—*Fmrs.' Bull. U.S. Dept. Agric.*, no. 1017, revised, 29 pp., 15 figs., 1 ref. Washington, D.C., October 1927.

Practically no alteration has been made in this revised edition of a bulletin previously noticed [*R.A.E.*, B, vii, 104] except in the section dealing with demodectic or follicular mange, caused by *Demodex bovis*, Stiles. This form of mange in cattle has not often been recognised in the United States until within the last few years, but the damage that it causes to leather is so great that interest in it has been stimulated, and numerous cases, mostly in old cows of dairy breeds, were reported from 14 States in 1927. *D. bovis* does not ordinarily spread rapidly from one animal to another, but infected animals should be isolated, as there is no known practicable remedy, although frequent dippings delay the progress of the infection and may cure mild cases.

HASEMAN (L.). **Controlling Horn and Stable Flies.**—*Bull. Missouri Agric. Expt. Sta.*, no. 254, 10 pp. Columbia, Mo., July 1927.

In all parts of Missouri, as well as in the Mississippi Valley, the southern United States and the western range lands, the stable fly, *Stomoxys calcitrans*, L., and the horn fly, *Lyperosia* (*Haematobia*) *irritans*, L., cause heavy losses among dairy animals. The former prefers decaying straw for oviposition, or horse manure mixed with straw, but very seldom horse manure alone; the larvae hatch in 1–3 days and may become full-fed in from 11 to 15 days under favourable conditions, the pupal stage lasting 6 to 20 days or more. The female of *L. irritans* oviposits in fresh cow-dung; the larvae hatch in 1 or 2 days and enter the surface layer; in 4–6 days they are fully fed and penetrate to the ground, which they enter for pupation, the period from egg to adult being from 10 to 16 days. The prompt spreading out of the breeding material of both species so that it will quickly dry will do much to reduce the numbers of these pests. As considerable benefit was said to be obtained from certain commercial fly salts, one of these was thoroughly tested, but was found to have absolutely no effect on the numbers of either fly. Observation revealed that cows that were 90 per cent. or more black in colour had about 50 per cent. more horn flies on them than the lighter coloured ones, but on the other hand, the darker ones had slightly fewer stable flies than the lighter ones. Some formulae are given for sprays that kill the flies and also act as repellents. In no case is the repellent action effective for more than a few hours, and the sprays should be applied at least once a day, preferably each night and morning. A satisfactory mixture is 2 U.S. gals. coal oil and 1 lb. flaked naphthalene, used as a very fine mist spray. One U.S. gal. crude oil can replace 1 U.S. gal. coal oil, or 1 U.S. pint crude creosote or carbolic acid can replace the flaked naphthalene in the first formula. A mixture of 2 gals. of crank case oil and 1 lb. flaked naphthalene is very cheap, but must be used carefully, as it may contain petrol and might injure the hide or hair. All the sprays, however, are liable to cause injury unless used sparingly, while that

containing carbolic acid may cause poisoning. Against horn flies the backs of the animals should be treated and the legs in particular for stable flies. Some simple trap might be devised for catching the flies on the cows as they enter the milking shed ; those at present used are much too elaborate and expensive to be generally practical.

ROARK (R. C.), PARMAN (D. C.), BISHOPP (F. C.) & LAAKE (E. W.).
Repellents for Blowflies.—*Indust. Engng. Chem.*, xix, no. 8, pp. 942-944, 5 refs. Easton, Pa., August 1927.

Additional tests of blow-fly repellents carried out in Texas in 1926 on the same lines as previously [*R.A.E.*, B, xv, 194], in which the powders were diluted with kaolin and the liquids with medicinal mineral oil in the ratio of 9 parts diluent with 1 part repellent, showed that strongly odorous materials, such as bergamot or other essential oils, which are quite effective in repelling *Cochliomyia macellaria*, F., from meat when applied undiluted, lose nearly all their efficiency and may become actually attractive when diluted with an inert vehicle ; whereas copper carbonate, which is entirely inodorous, is nearly as effective in 10 per cent. strength as when applied undiluted. The most effective materials are those that can absorb, adsorb, or inhibit the formation of, the volatile compounds evolved by decomposing meat that render it attractive to flies. In addition to various copper compounds, such strong antiseptics as mercury bichloride, potassium permanganate, sodium salicylate, etc., render meat almost entirely unattractive to blow-flies.

IMES (M.). **Sheep and Goat Lice and Methods of Control and Eradication.**—*Leaflet. U.S. Dept. Agric.*, no. 13, 8 pp., 3 figs., 1 ref. [Washington, D.C., 1928.]

The sucking lice commonly found on sheep in the United States are *Linognathus* (*Haematopinus*) *ovillus*, Neum., and *L. pedalis*, Osb., the common biting louse being *Trichodectes ovis*, L. (*sphaerocephalus*, Olf.). *L. stenopsis*, Burm., the sucking louse of the goat, is widely distributed. Several species of biting lice attack goats, the more common being *T. caprae*, Gurlt (*climax*, Nitz.) and *T. limbatus*, Gerv. (*hermsi*, Kellogg & Nakayama).

The various stages in the life-cycle of these lice on their hosts has not been accurately determined ; the eggs hatch in about 10 days. The methods of detecting the lice and their effect on the animals are discussed. Notes are given on such remedial measures as dusting and fumigation, but dipping is much the most effective. The animals need not be kept in the dip longer than is necessary to wet them thoroughly, 1-2 minutes being usually sufficient, but their heads should be ducked under the surface of the liquid at least twice while they are in the vat. It is not necessary to heat the dip, but the temperature should not be lower than 65° F. Lice may be controlled by dips of coal-tar creosote, tobacco or nicotine, and arsenicals. Arsenical dips are the most effective, but must be used with special precautions on sheep and goats, which must be kept in the draining pens until all the surplus dip has run off.

PARMAN (D. C.). **Experimental Dissemination of the Tabanid Egg Parasite, *Phanurus emersoni* Girault, and biological Notes on the Species.**—*Circ. U.S. Dept. Agric.*, no. 18, 6 pp., 2 figs., 3 refs. Washington, D.C., January 1928.

Investigations of *Tabanus hyalinipennis*, Hine, along the south escarpment of the Edwards Plateau, north of Uvalde, in south-western Texas, were begun in 1914, as the attacks of Tabanids on cattle and horses had been troublesome for a number of years in the district, and there was evidence that these flies had played a part in the transmission of anthrax, a rather severe outbreak of which occurred in the summer of 1913.

In 1914 the eggs of *T. hyalinipennis*, which are mostly laid on fairly small stones projecting a few inches from the water in rapids where the streams spread over gravel in sunny, open places, were very abundant, and about 97 per cent. of the egg-masses collected in one area were found to be parasitised by a Scelionid, subsequently described as *Phanurus emersoni*, Gir. [*R.A.E.*, B, iv, 122]. The adults of the parasite are most active during bright, hot weather and have never been observed in misty or rainy weather. *T. hyalinipennis* is most prevalent after seasons in which there are heavy and continued summer rains; this may be accounted for by the fact that during such seasons the breeding grounds of the Tabanid are greatly increased, while the activity of the parasite is decreased.

The adults of *P. emersoni* mate almost immediately after emergence, and oviposition begins in 4–24 hours. Fresh eggs are preferred, and females have never been induced to oviposit in eggs more than 5–6 hours old. The ovipositor can apparently be inserted between the eggs of the top layers of a mass into those below, but not more than 93 per cent. of the eggs of a mass have ever been found to be parasitised, while the average for any considerable number of masses has never been above 60 per cent. Apart from the fact that 114 parasites were reared from three egg-masses in which a single captured female had oviposited, the reproductive capacity of *P. emersoni* is not known. The adults were never observed to feed and rarely lived more than two days, the males dying a few hours after mating and the females soon after oviposition. The life-cycle required 12–19 days. The adults begin to appear in the early summer, as soon as the weather has continued hot for some days, the earliest recorded appearance being 10th May, from eggs collected on 23rd April; the latest emergence took place on 1st October. The eggs of *T. hyalinipennis* hatch in 5–9 days.

It was thought that the most feasible means of controlling *T. hyalinipennis* would be to collect egg-masses and place them along the streams in vessels that would allow the parasites to escape but would retain the Tabanid larvae so that they could be destroyed. In 1914 this was done along one river, and it was estimated that 10–12 U.S. gallons of egg-masses, or between 20 and 25 million eggs were collected; in 1915 it was estimated that the decrease in the number of flies was 50 per cent. greater in the area in which this had been done, which was previously the most heavily infested, than elsewhere, and about 50 per cent. of the eggs collected were found to be parasitised, a higher percentage than anywhere else. From July to September 1915 a total of 52 U.S. pints of parasitised eggs was collected along this river and distributed in 105 localities, from each of which samples of egg-masses were collected; parasites were reared from 51 of the 105 collections. From 1916 to 1926, collections of egg-masses were made

over parts of the area in which the parasite was distributed ; parasites were reared from 136 out of 139 collections, the percentage of eggs parasitised being generally lower in the eastern half of the area, in which the rainfall is heavier.

There has been a general decrease in the numbers of *T. hyalinipennis* on the escarpment since 1914, and it is believed that the distribution of *P. emersoni*, supplemented by the collection of egg-masses, has played a large part in bringing this about, although climatic conditions have also had their effect. The parasite is thought to have destroyed about 50 per cent. or more of the Tabanid eggs in the seasons most favourable to it, which are those with a high percentage of sunshine, and 10 per cent. or less in the least favourable ones.

BRUCE (E. A.). **Entomological Notes of Veterinary Interest.**—*Proc. Ent. Soc. Br. Columbia*, no. 24, pp. 26–29. Victoria, B.C., 1927.

Drosophilid pupae were found in milk in Vancouver on several occasions during 1919 and 1920, attached to the sides of the bottles near the bottom. The position suggests that sour milk had been left in the bottom of the bottles. The egg, larval and pupal stages of *Drosophila* are said to occupy 2, 6 and 5 days, respectively, at room temperature, so that considerable interference was apparently withstood, as the bottles are washed three times in a 10 per cent. solution of soda, first cold, then warm, and then at a temperature of 160–165° F., and are finally rinsed in hot water and left to dry. No further complaints occurred after dairymen had been warned to take greater care in washing.

Larvae of *Eristalis tenax*, L., were found on Vancouver Island in the vagina of a cow that had calved about two months previously. A discharge was present and the diseased condition was probably responsible for the parasitism. With proper attention the cow made a complete recovery.

Of the ticks occurring in British Columbia the most important are *Dermacentor venustus*, Banks, which causes tick paralysis in man and animals, especially sheep [*R.A.E.*, B, x, 198 ; xiv, 10], and *D. albipictus*, Pack., which is commonly found on large domesticated and wild animals, sometimes causing anaemia and even death of horses and mule deer. *D. albipictus*, being a one-host tick, can be controlled comparatively easily by dipping in early spring or late autumn. *D. venustus* is a three-host species, the life-cycle of which rarely occupies less than two years and may occupy three or four ; the adults are commonly found on the larger animals, chiefly horses, cattle and sheep, but also occur on a number of smaller animals, and the larval and nymphal stages are passed on rodents.

TWINN (C. R.) & HERMAN (F. A.). **A Cheap and Effective Fly Spray.**—*Sci. Agric.*, viii, no. 7, pp. 441–445. Ottawa, March 1928.

Numerous mixtures were tested as sprays for flies, particularly *Musca domestica*, L., none of which was satisfactory with the exception of those containing pyrethrum dissolved in kerosene. Solutions containing different percentages of pyrethrum were tested and compared with the best proprietary spray on the market, and it was found that all were equally effective in bringing down the flies with the exception of the weakest solution (1 per cent. pyrethrum), which

was slower in action than any of the others. Observations were then made to discover what percentage of the flies recovered from the effect of the sprays, and the results showed that the stronger concentrations of pyrethrum gave the highest mortality, and indicated that the proprietary brand was rather less effective than the 10 per cent. solution of pyrethrum. To test the efficiency of these sprays against flies in farm buildings, a building of 35,000 cu. ft. capacity in which pigs were kept was sprayed with less than 2 quarts of a 4 per cent. pyrethrum solution; the majority of the flies were lying on the floors and window sills at the end of 15 minutes, and although the spray irritated the skins of the pigs, it left no apparent ill effects. This treatment resulted in the destruction of a considerable proportion of the flies.

For all practical purposes a 6 per cent. solution is satisfactory. This is prepared by adding $\frac{1}{2}$ lb. pyrethrum to 1 gal. kerosene, agitating it at intervals throughout a period of about two hours to ensure that practically all the active principal of the pyrethrum is dissolved, and syphoning or filtering off the clear liquid. When the spray is required for household use, water-white kerosene should be used to prevent the possibility of staining fabrics or furniture, and 3 fl. oz. methyl salicylate may be added to each gallon to impart a pleasant odour. The spray should be kept in a tightly corked container to prevent it from deteriorating. The flies should be swept up shortly after the application of the spray and burnt or thrown into hot water, otherwise a certain percentage of them may recover. Tests have indicated that this material when in the form of a fine spray is not very inflammable, but it is inadvisable to use it in the presence of a naked flame.

SONAN (J.). **Notes on the Myiasis-producing Diptera of Man and domestic Animals. I-II.** [*In Japanese.*]—*Formosan Agric. Rev.*, xxi, nos. 10-11, pp. 897-910 & 982-990. Taihoku, Formosa, October & November 1927.

In the first part of this paper a general account is given of the flies causing myiasis in various parts of the world, and in the second notes on such as occur in Formosa, with a historical review of the subject in Formosa and Japan.

Chrysomya bezziana, Villen., is very injurious to cows, buffaloes and sheep, sometimes causing death, in the southern half of Formosa; *C. megacephala*, F., also infests these animals. *Oestrus (Gastrophilus) intestinalis*, DeG., is sometimes found in horses imported from Japan, but is not an important pest. *Cephalomyia (Oestrus) ovis*, L., was imported with sheep from China in 1915 and caused serious damage. *Hypoderma bovis*, DeG., has been recorded from a cow, but is now no longer found in Formosa.

SALING (T.). **Die Kriebelmückenschäden in Preussen während der Jahre 1925 und 1926.** [Losses caused by Simuliids in Prussia in 1925 and 1926.]—*Deuts. tierärztl. Wschr.*, xxxvi, no. 9, pp. 133-135, 12 refs. Hanover, 3rd March 1928.

This record of the losses among cattle caused by Simuliids is compiled from official reports. Such losses have occurred in spring during the past decades in the districts on the Aller and Leine rivers, but their

occurrence in 1925 in the Johannesburg district of East Prussia was unexpected, and is attributed to the very wet spring. Larvae and pupae were found up to June, especially in luxuriant growths of *Potamogeton*.

PETER (—). **Eine wirksame Methode zur Bekämpfung der Dassel-fliegenplage.** [An efficient Remedy against the Warble Pest.]—*Berliner tierärztl. Wschr.*, 1927, p. 769. (Abstract in *Deuts. tierärztl. Wschr.*, xxxvi, no. 9, p. 142. Hanover, 3rd March 1928.)

In view of the specific lethal effect of pure phenol on the larvae of *Hypoderma* attacking cattle, a proprietary ointment containing it has been prepared. It kills the larvae *in situ*, and their removal by squeezing is facilitated by the emollient action of the ointment on the edges of the opening and by the softening of the bodies of the larvae.

GALLI-VALERIO (B.) & BORNAUD (M.). **Sur quelques maladies parasitaires des petits animaux domestiques observées dans le canton de Vaud.**—*Schweiz. Arch. Tierheilk.*, lxi, p. 519, 1927. (Abstract in *Deuts. tierärztl. Wschr.*, xxxvi, no. 10, pp. 184–185. Hanover, 10th March 1928.)

The tape-worm, *Dipylidium caninum*, the larvae of which occur in *Pulex irritans* and *Ctenocephalus canis* (*serraticeps*), was found in dogs and cats. The following mites were recorded: *Demodex caprae* on a goat; *Chorioptes auricularum* var. *cati* on cats; *Psoroptes ovis* on sheep; *P. cuniculi* in the ears of rabbits; *Notoedrus* (*Sarcoptes*) *cati* on cats and transmissible to rabbits; *Cnemidocoptes* (*S.*) *mutans*; *C. (S.) laevis*, and *Lophoptes patavinus*, which was very rare, on fowls; and *Cheiletiella parasitivorax* on rabbits. A tick, *Ixodes hexagonus*, occurred on dogs.

Insect parasites were the lice, *Menopon gallinae* (*pallidum*) on fowls, *Gliricola porcelli* (*Gyropus gracilis*) on guineapigs, *Trichodectes subrostratus* on cats, *T. ovis* (*sphaerocephalus*) on sheep, *T. latus* and *Linognathus* (*Haematopinus*) *piliferus* on dogs, *H. suis* on pigs, and *H. aemodipsus* *ventricosus* on rabbits; a flea, *Ceratophyllus fasciatus* on guineapigs associated with rats; and the Hippoboscid, *Melophagus ovinus* on sheep.

SÉGUY (E.). **Etudes sur les mouches parasites. Tome I. Conopides, Oestrides et Calliphorines de l'Europe occidentale.**—*Encyc. Ent.*, [Sér. A] ix, 251 pp., 6 pls., 250 figs., 20 pp. refs. Paris, Paul Lechevalier, 1928. Price Frs. 65.

The second part of this book (pp. 53–192) contains a detailed account of the Oestrids and Calliphorids of western Europe, with keys to the genera and species and descriptions of the adults, and notes on biology and distribution. Many species found in other parts of the Palaearctic Region and a few North American ones are also included. The author uses the term "Oestridae" in a broad sense, to include the GASTROPHILINAE, which he places in the ANTHOMYIIDAE, and the HYPODERMATINAE and OESTRINAE, which, with the CALLIPHORINAE, he places in the TACHINIDAE.

SENEVET (G.) & PRUNNELLE (M.). **Note sur *Culex impudicus*, Ficalbi, 1890.**—*Bull. Soc. Hist. nat. Afr. N.*, xviii, no. 8, pp. 201–202, 1 fig., 4 refs. Algiers, 1927.

A figure is given of the male genital armature of *Culex impudicus*, Fic., which the authors reared from larvae found in grassy ditches in several localities in Algeria. This species was described from Sardinia, and it has been suggested by Edwards that *C. nebulosus*, Theo., is identical with it, but the Algerian specimens, the genitalia of which agree closely with Ficalbi's description, differ from *C. nebulosus* both in these and in other characters.

[LEESON (H. S.).] **How to make Rhodesia a Fever-free Country. Fighting the Mosquito.**—6 pp., 3 figs. [Salisbury, 1928.]

This paper is a summary of a popular lecture on mosquitos and their control, with particular reference to Rhodesia [*cf. R.A.E.*, B, xvi, 104].

ARLO [J.]. **Une mission antipaludique à la Réunion.**—*Ann. Méd. Pharm. col.*, xv, no. 4, pp. 413–447. Paris, 1927.

This report of an anti-malarial mission to Réunion in 1926, includes a survey of the geography and climate, a brief history of the occurrence of malaria, and the results of school inspections throughout the island showing the incidence of *Plasmodium vivax*, *P. malariae* and *P. falciparum* (*praecox*) in children, and gives a fuller account of a proposed plan of campaign against the disease already noticed [*R.A.E.*, B, xv, 18], including the usual anti-mosquito measures.

CHAIGNEAU (Y.). **Six mois de lutte contre les moustiques et les rats à Tiaroye (Sénégal) juillet-décembre 1925.**—*Ann. Méd. Pharm. col.*, xv, no. 4, pp. 448–458. Paris, 1927.

Measures against mosquitos carried out from July till December 1925, which included systematic collections of larvae, resulted in the discovery of larvae of *Anopheles* and *Culex*, and in one case only of *Aedes* (*Stegomyia*). The number of adult mosquitos found in dwellings in 1926 showed a great decrease as compared with 1923, while there were no cases of yellow fever, dengue or plague, only one primary case of malaria occurring among the European population.

BLOW (T. B.). **Observations on the alleged larvicidal Properties of Charophyta.**—*Proc. Linn. Soc. London*, Sess. 139, pp. 46–47. London, 1927.

As certain waters in Madagascar were found to contain either an abundance of mosquito larvae or of Charophyta, a number of plants of different species of *Chara* were obtained in England for experimental purposes. The plants were cultivated in large glass jars into which the mosquito larvae were then introduced. The effect of a solution of the glucoside prepared from dried *C. zeylanica* from Madagascar was also

tested. The mosquitos used were *Theobaldia annulata*, Schr., *Culex pipiens*, L., and *Anopheles maculipennis*, Mg. As a result of these experiments, it is concluded that Charophyta do not possess any larvicidal properties and that some other factor must be the cause of the absence of mosquito larvae in places where these plants occur.

MATHESON (R.) & HINMAN (E. H.). *Chara fragilis* and Mosquito Development.—*Amer. J. Hyg.*, viii, no. 2, pp. 279-292, 22 refs. Baltimore, Md., March 1928.

Since Caballero's observations on the larvicidal powers of *Chara* spp. [R.A.E., B, xi, 76, etc.], the general trend of opinion has been to discredit the value of plants of this genus with regard to mosquito destruction [B, xiii, 28, etc.] In 1923, a spring-fed pond was discovered in New York State in which *C. fragilis* grew densely and in which no mosquito larvae were present. During 1924 the same conditions prevailed, and in 1925 experiments were undertaken to determine the effect of this plant. It was found that *Culex territans*, Wlk., bred in great numbers in wooden pails sunk in the ground, but in pails containing *C. fragilis* eggs were only laid occasionally and the larvae died. An attempt was then made to determine what were the factors in this medium that repelled the females and prevented larval development. For this purpose a suitable aquarium was used in which *C. fragilis* from the pond was placed. The mosquitos used were *Culex pipiens*, L., *C. territans*, *Aedes vexans*, Mg., and *Anopheles punctipennis*, Say, larvae of various stages of development being employed. The results show that in almost every case the death rate was almost 100 per cent. The conditions of the experiments were ideal for rapid larval development, except for the changes resulting from the addition of *C. fragilis*. The most marked and easily measured change was in the pH values. During the 12 hours from 3 a.m. to 3 p.m. the pH range was from 7.6 to 9.4, and it is difficult to credit that ordinary photosynthetic activity would produce such variation. It seemed probable that the efficient factor in the destruction of larvae was the high pH, which agrees with the findings of previous investigators [B, x, 25; xiv, 33], and this was confirmed by experiments with buffer solutions, with pH values of from 8 to 9.8, practically all larvae, whether half-grown or mature, being killed. In the course of these experiments, it was found incidentally that boric acid was toxic to the larvae [see next paper]. *C. fragilis* was then tested under natural conditions in the original pond by enclosing 300 larvae of *Culex pipiens* in five cages made of mosquito netting surrounded by two layers of cheesecloth. Any emerging adults would be caught in the top of the cages above the water. After ten days four adults in all had emerged, and a week later no living larvae or adults were found in any of the cages. The effect of watery solutions of dried leaves of *C. fragilis* was also tried on *Culex pipiens*, the results showing that concentrations of $\frac{1}{2}$ to 1 oz. per 12½ pints had a marked effect on larval development, over 50 per cent. of young larvae being dead within 48 hours and all within 4 days at the higher concentration.

An investigation of the pH changes in the presence of *Chara* showed a marked daily pH cycle in all the experiments, and a similar cycle was found to occur in the aquaria for the plants, *Oedogonium* and *Philotria* (*Elodea*). It is well known that *Chara* deposits calcium

carbonate in its cortical layer, and this process is probably associated with photosynthetic action, which is accompanied by high pH values. It is thought possible that in these complicated reactions the plant may produce some substance that has a lethal effect on Culicid larvae; this substance, however, is not permanent. Water taken from aquaria when the pH is at its highest and transferred to other aquaria has no apparent effect on larval development and the pH falls quite rapidly. The problem of the introduction and cultivation of *C. fragilis* in pools, slow flowing streams, marshy areas, etc., has yet to be attempted. If it can be introduced, the plant should be of practical value in anti-mosquito measures.

MATHESON (R.) & HINMAN (E. H.). **A new Larvicide for Mosquitoes.**—*Amer. J. Hyg.*, viii, no. 2, pp. 293–296. Baltimore, Md., March 1928.

An observation noticed in the preceding paper led to the carrying out of tests with commercial borax as a mosquito larvicide, this substance being found quite as efficient for the purpose as chemically pure borax, either crystalline or calcined sodium borate. The species used were *Culex pipiens* and *Aedes vexans*, and at concentrations of 0.3 oz. of borax or more to 10 pints of water, only 12 adults emerged out of 8,900 larvae, and all of these emerged within 2 to 4 days of introduction into the liquid, so that they were almost mature at the beginning of the experiment. The addition of food to the water in no way detracted from the efficiency of the borax. Eggs apparently hatched normally in the solutions, but all the resultant larvae died within two days. The solution did not seem repellent to ovipositing females, as in vessels left uncovered natural depositions of egg masses occurred. The solutions had a constant pH of 9 or above in spite of water being added at various times to replace evaporation, and they retained equal efficiency after about six weeks. It is believed that borax will prove a practical and safe larvicide in cisterns, rain-water barrels and any container for water for other purposes than drinking, and perhaps in temporary and permanent pools where the plant and animal life is of little importance. In the latter places it might be necessary to renew the supply of borax at long intervals. It should be possible to manufacture a borax of sufficient purity for use as a larvicide at a very low cost.

MILLER (S.). **Lessons from the Campaign of 1926.**—*Proc. 14th Ann. Mtg. New Jersey Mosquito Exterm. Ass., Atlantic City, 1927*, pp. 5–8. [New Brunswick, N.J.] 1927.

The 1926 mosquito campaign in New Jersey was the most successful on record from 1st May till 1st August, but the normal drainage methods adopted proved entirely inadequate to cope with the unprecedented and continuous rainfall that occurred from 19th July till 18th August, causing water to remain standing long enough to breed enormous numbers of *Aedes vexans*, Mg. (*sylvestris*, Theo.) and *A. sollicitans*, Wied. In order to deal with a possible repetition of such conditions, reserves of machinery, tanks and pumps are to be provided, and a reserve force of workers is to be created.

HOWARD (L. O.). U.S. Bur. Ent. **What Workers with Mosquitos did during 1926.**—*Proc. 14th Ann. Mtg. New Jersey Mosquito Exterm. Ass., Atlantic City, 1927*, pp. 8-23, 2 refs. [New Brunswick, N.J.] 1927.

The greater part of the literature dealing with mosquitos and their control surveyed in this paper was published in 1926 and has already been noticed in this *Review*. The author issues a warning against acceptance of the theory of mosquito control by means of bats [*R.A.E.*, B, i, 176 ; viii, 203 ; xiii, 24 ; xiv, 125] and gives instances of persons receiving severe bites and even contracting malaria in close proximity to bat roosts.

HEADLEE (T. J.). **Some important unsolved Problems in Mosquito Work of New Jersey.**—*Proc. 14th Ann. Mtg. New Jersey Mosquito Exterm. Ass., Atlantic City, 1927*, pp. 64-70. [New Brunswick, N.J.] 1927.

Although the mosquito population of New Jersey has been enormously reduced by the control measures adopted there, more than 83 per cent. of the inhabitants of the State benefiting from the protection afforded, only about half of the affected salt-marsh and one-third of the upland areas have been treated for the prevention of mosquito breeding, and even some of these require further work to render them permanently satisfactory. The most important problem that is still unsolved is that of controlling mosquito breeding under heavy and continuous rainfall, which renders the removal of water from salt marsh areas more difficult and has a particularly important effect on upland mosquito breeding.

LESLIE (J. B.). **Proposed Solutions for important unsolved Problems in Mosquito Work of New Jersey.**—*Proc. 14th Ann. Mtg. New Jersey Mosquito Exterm. Ass., Atlantic City, 1927*, pp. 70-84. [New Brunswick, N.J.] 1927.

This paper, which constitutes a reply to the preceding one, discusses the possible extension of draining and oiling operations, both in salt marsh and upland areas, and suggests various measures for preparing to deal with periods of abnormal rainfall, including the substitution of mechanical for manual labour where possible, the maintenance of reserve equipment, an increase in the number of trained workers and the training of emergency inspectors. Maps should be prepared in each district during the dry season showing all depressions likely to constitute breeding areas under abnormal conditions.

JACKSON (L. E.). **Memorandum on Trials with *Gambusia* in Hudson County.**—*Proc. 14th Ann. Mtg. New Jersey Mosquito Exterm. Ass., Atlantic City, 1927*, pp. 84-86. [New Brunswick, N.J.] 1927.

Tests with *Gambusia patruelis* and *G. affinis*, each of which gave practically the same results, showed that these fish have a decided preference for mosquito larvae, thrive equally well in salt and fresh water and are not disturbed by a rather high degree of pollution. They thrive best at a temperature of 73° F. in water containing some vegetation, a condition under which successful oiling is most difficult. Their

preference for shallow water leads them to seek the inland ends of ditches, where mosquito breeding is heaviest, and prevents them from passing from the ditches into deep water from which they are not likely to return, thus rendering them suitable for salt marsh control. Although these fish are viviparous and are said to reproduce very rapidly where a high temperature is maintained, the breeding season in New Jersey is likely to be short and no great increase in the number of fish imported could be expected there, while it is not yet certain that they will be able to survive the winter. Mosquito larvae remain absolutely still when aware of the approach of the fish, which rarely take one unless it is moving, and shelter beneath vegetation or in the corners of a tank to escape detection.

SAMMIS (R. H.). **Progress of Mosquito Work in Nassau County, New York, for the Year 1926.**—*Proc. 14th Ann. Mtg. New Jersey Exterm. Ass., Atlantic City, 1927*, pp. 107–110. [New Brunswick, N.J.] 1927.

The only areas in this county in which mosquitos were successfully controlled during the past season of unusual rainfall were those in which two automatic electric pumps were working. The author considers this method of control more suitable in low areas that cannot be drained by gravity than the more expensive continual oil treatment. In this connection various power sprayers and pumps are described.

GIBSON (A.). **Mosquito Investigations in Canada in 1926.**—*Proc. 14th Ann. Mtg. New Jersey Mosquito Exterm. Ass., Atlantic City, 1927*, pp. 110–115, 2 pls. [New Brunswick, N.J.] 1927.

The small top minnow, *Gambusia affinis*, imported into Banff, Alberta, from California, survived the winter in warm sulphur pools, and is apparently breeding freely. Notes are given on species of *Aedes* observed in southern Manitoba in 1923 and in Saskatchewan and New Brunswick in 1926. Good results secured by oiling breeding areas in the neighbourhood of Ottawa were partly nullified by an invasion of the flood-water mosquito, *Aedes sticticus*, Mg. (*hirsuteron*, Theo.), from untreated areas in the north and centre of the city [cf. *R.A.E.*, B, xv, 232]. The addition of $\frac{3}{4}$ oz. of a 50 per cent. solution of caustic soda in water to each gallon of oil immediately before application secured rapid and even spreading, the film remaining on treated waters at least 7 days in spite of heavy rains. Constant stirring is required to keep the caustic soda in solution during application. A marked reduction in the number of *Culex pipiens*, L., in a swamp in the neighbourhood of Montreal [*R.A.E.*, B, xv, 201] was effected in 1926 by one application of oil in combination with sawdust, though complete control is not likely to be secured without the removal of the sewage contamination that at present exists; this kills the fish and produces ideal conditions for the mosquitos.

[**Mosquito Control Work and Methods.**]—*Proc. 14th Ann. Mtg. New Jersey Mosquito Exterm. Ass., Atlantic City, 1927*, pp. 23–64 & 115–136. [New Brunswick, N.J.] 1927.

Reports are given on mosquito extermination work carried out in New Jersey and various other States. Other papers included are: "The Reclamation of the Salt Marshes of New Jersey for Agricultural

Purposes," by W. T. Donnelly; and "The Effect of Various Chemicals on the Spreading and Penetration of Oils in Different Mosquito Breeding Places," by J. M. Ginsburg [*R.A.E.*, B, xvi, 50].

WELLINGTON (A. R.). **Panama Health Conditions past and present.**—8vo, 46 pp. Singapore, 1927.

This interesting account of the medical history of Panama and the Panama Canal, and the present health organisation in the Canal Zone and the cities of Panama and Colon, includes a chapter on the measures employed by the Health Department for the control of mosquitos.

SHANNON (R. C.) & DAVIS (N. C.). **Condiciones de reproducción de *Anopheles pseudopunctipennis* en la provincia de Tucumán durante la estación seca.** [The Reproduction of *A. pseudopunctipennis* in the Argentine Province of Tucumán during the dry Season.] — *Rev. Inst. bact.*, iv, no. 7, pp. 662-678, 5 figs. Buenos Aires, 1927. (With Summaries in French, English and German.)

Anopheles pseudopunctipennis, Theo., the chief vector of malaria in north Argentina, can breed throughout the year, but its numbers are reduced during the dry season, May to November, as many of its breeding-places then disappear. The cold of the winter, with occasional frosts, does not kill the larvae, though it prolongs the time of development, but cold weather followed by drought causes the rotting and drying of the algae providing food and shelter, and the microscopic larval food probably diminishes for the same reasons. In the breeding-places that remain the water becomes charged with impurities unfavourable to the larvae. Breeding-places in the dry season are found not only in the mountain valleys but also in some places in the plains, both types being supplied by mountain springs and small rivers. The adults do not hibernate, and they rapidly decrease in number in the cold, somewhat rainy weather in May and early June.

SHANNON (R. C.), DAVIS (N. C.) & DEL PONTE (E.). **La distribución del *Anopheles pseudopunctipennis* y su relación con el paludismo, en la Argentina.** [The Distribution and Relation to Malaria of *A. pseudopunctipennis* in Argentina.] — *Rev. Inst. bact.*, iv, no. 7, pp. 679-705, 12 figs., 3 maps, 29 refs. Buenos Aires, 1927.

The distribution of *Anopheles pseudopunctipennis*, Theo., in Argentina coincides with the important malarial zone in the north-western provinces. A less important zone occurs on the Bermejo, Paraná and Paraguay rivers, where *A. pseudopunctipennis* does not occur, *A. albittarsis*, Arrib., *A. argyritarsis*, R.-D., and *A. tarsimaculatus*, Goeldi, being possible vectors. In Argentina, as in other countries, *A. pseudopunctipennis* appears to prefer mountain districts and breeding-places containing algae. The factors that limit its spread in Argentina are the fact that it is a mountain species, the barrier opposed by the vast semi-arid plains in the east and south-east, and the fact that the adults do not hibernate, so that the cold winter in the south prevents its spread there. It is more abundant at the end of the rainy season, and at that time malaria extends further to the east and south. Malaria does not occur in Buenos Aires, the Anophelines there not being vectors.

SHANNON (R. C.) & DEL PONTE (E.). **Informe de una investigación preliminar sobre los Anofeles del río Alto Paraná, en la Argentina.** [Report on a preliminary Investigation on the Anophelines of the Upper Paraná River in Argentina.]-*Rev. Inst. bact.*, iv, no. 7, pp. 706-723, 5 figs. Buenos Aires, 1927.

An investigation of the Anophelines of the Upper Paraná river in the state of Misiones, Argentina, was made in June 1927 to ascertain the vectors of a severe epidemic of malaria in March, April and May. Heavy rain and the onset of winter prevented full data being obtained. This malarial zone differs completely from that of north-west Argentina, the vector found there, *Anopheles pseudopunctipennis*, Theo., being absent and the terrain being of a quite different nature and a continuation of the adjacent high plateau region in Brazil, with volcanic rocks, dense forests and a heavy rainfall. Two of the most dangerous carriers in Brazil, *A. albitarsis*, Arrib., and *A. tarsimaculatus*, Goeldi, were found, as well as *A. argyritarsis*, R.-D., and while the region is mostly densely wooded, the increase in population in recent years has led to large areas being cleared and thus rendered suitable for their breeding. The clearing of forests and increase in population will result in serious epidemics unless care be taken to leave trees on the banks of rivers, marshes, etc., so that the waters remain shaded. The physical and climatic conditions of this region and their influence on the mosquito fauna are described. Two groups of *Anopheles* occur: *Arribalzagia* and *Nyssorhynchus*. The former, unimportant as regards malaria, breed in shaded water, while the latter, including the three species mentioned above, prefer sunlit water. Epidemics occur during the dry periods following heavy rains, when the pools and crevices in the rocky beds of streams are filled and then exposed to sunshine, thus becoming excellent breeding-places. The regions surrounding the Upper Paraná valley, Paraguay, Uruguay, Corrientes (Argentina) and Rio Grande do Sul (Brazil), are for the most part low-lying, non-volcanic, and more or less treeless, and have a smaller rainfall. They are less suitable for the *Nyssorhynchus* group, and while epidemics of malaria occur, the disease is not endemic.

During a second visit, in October 1927, the most striking fact was the total absence of *A. albitarsis* and the few new cases of malaria. This species therefore does not occur throughout the year and either comes from the regions up stream (the inhabitants state that epidemics occur after the river has been in flood, when eggs and larvae can be washed down) or from the regions lower down where it is known to occur at all times of the year.

SHANNON (R. C.) & DEL PONTE (E.). **Cuatro notas sobre especies nuevas de Dípteros Nematóceros, hematófagos o no, de la República Argentina.** [Four Notes on new Diptera Nematocera, blood-sucking or otherwise, in Argentina.]-*Rev. Inst. bact.*, iv, no. 7, pp. 724-736, 1 pl., 8 refs. Buenos Aires, 1927.

The first of these notes deals with the mosquitos collected by the late Dr. J. Petrocchi and listed by her [*R.A.E.*, B, xii, 75], four new species being described.

The second gives a key to the Argentine species of *Phlebotomus*, namely *P. sordellii*, sp. n., *P. cortellezii*, Brèthes, *P. araozi*, Paterson

& Shannon, and *P. mazzai*, Paterson. A fifth species, possibly *P. migonei*, França, has also been taken.

The third and fourth notes describe a new Psychodid and a new Ceratopogonid.

PATERSON (G.) & SHANNON (R. C.). **Los Simúlidos del Noroeste Argentino.** [The Simuliids of North-west Argentina.]—*Rev. Inst. bact.*, iv, no. 7, pp. 737-742, 3 refs. Buenos Aires, 1927.

In view of the possibility that leishmaniasis in the provinces of Salta and Jujuy is transmitted by Simuliids, a key is given to the following species found in north-west Argentina: *Simulium* (*Eusimulium*) *dinellii*, Joan. S. (*E.*) *inaequalis*, sp. n., *S. (E.) lahillei*, sp. n., *S. jujuyense*, sp. n., and *S. delpontei*, sp. n.

TAYLOR (F. H.). **Notes on the Life-histories and Habits of some Australian Mosquitoes.**—*Health*, vi, no. 1, pp. 1-5. Melbourne, January 1928.

Notes are given on the bionomics and distribution of *Anopheles annulipes*, Wlk., *A. bancrofti*, Giles, *Culex fatigans*, Wied., and *Aedes argenteus*, Poir. In captivity females of *A. annulipes* lay from 50 to 120 eggs singly. From April to July in north Queensland the larvae hatch in 60-72 hours, the larval stage lasts 7-10 days and the pupal stage 2-4. Eggs of *A. bancrofti* could not be obtained in captivity, but the duration of the larval and pupal stages appears to be about the same as for *A. annulipes*. *C. fatigans* may oviposit five times during its life, up to 300 or more eggs being laid at each oviposition; the eggs are laid in boat-shaped masses and hatch in about 24 hours, and the larval and pupal stages last about seven and two days respectively, but under adverse climatic conditions these periods may be considerably longer. *Aedes argenteus* lays up to about 80 eggs, singly, at each oviposition; normally the incubation period lasts about 24 hours, but it may be either shorter or longer; under optimum conditions the larval and pupal stages last 5-7 and 2-3 days respectively, but these periods are lengthened by cold.

Anopheles annulipes is widely distributed in Australia, but records for the Solomon Islands and Papua [*R.A.E.*, B, iii, 37, 153] are erroneous and should refer to *A. punctulatus*, Dön. The breeding places of *A. annulipes* are very varied [*R.A.E.*, B, xv, 165]; they include hoof marks on the edges of swamps, which are particularly favoured, and tins, and they may be either shaded or exposed to direct sunlight. The distribution of *A. bancrofti* is much more restricted; in Australia it is only known to occur in the Northern Territory and in Queensland. The larvae are generally found in moderately shallow water overgrown with grass and reeds, but not in small collections of water such as hoof-marks or in water exposed to direct sunlight; they occur in swamps more or less overgrown with reeds and sometimes in slowly running water.

Principles and Methods of Antimalarial Measures in Europe. Second General Report of the Malarial Commission.—95 pp., 1 map, 24 figs. Geneva, League of Nations, Hlth. Organis., 1927.

The purpose of this Commission is not to suggest appropriate anti-malarial measures to be carried out regardless of cost, but rather to

determine those most appropriate in countries where such measures as can be taken are limited financially, with due consideration of other diseases and conditions affecting public health. It is suggested that a central malaria research organisation continuously occupied with the subject and in close touch with similar organisations in other countries would be in the best position to advise regarding the measures upon which funds available for antimalarial work could most profitably be spent. In each European country, at least one area should be selected where detailed observations on malaria should be made at regular short intervals (say monthly) for several years, and an effort should be made to record accurately the amount and character of the disease and the numerical prevalence and infection rate of Anophelines in houses at regular intervals. The abundance of larvae of Anophelines in breeding-places in the neighbourhood of houses should be noted at different seasons of the year. There is no question of converting malarious zones into non-malarious ones, but merely of adopting such measures as will render malaria unimportant; measures aiming at eradication can only be justified in very exceptional circumstances. It is not considered always necessary to deal with malaria by measures against mosquitos. There are certain primary measures that are applicable everywhere; beyond these are supplementary ones that can only be determined by a study of the local conditions. In most cases, with the limited staff and funds available, there is danger in attempting simultaneously too many measures of control; it is better to bring one or two only to the highest possible standard. It is particularly undesirable to adopt measures in one country merely because they have been successful in another.

The Commission recognises only two direct anti-malarial measures, namely, killing the malaria parasite in man (with quinine) and killing it in mosquitos by destroying infected Anophelines in houses. In many parts of Europe the gratuitous distribution of quinine is the only measure that the countries concerned can afford to carry out. The Commission is convinced that if the killing of adult mosquitos within the house were made a part of the daily domestic task the results would be remarkable.

Of indirect methods of reducing malaria, the Commission attaches most importance to general schemes for improving the economic and social condition of the people. The stabilisation of a population, following settlement on the land, may result not only in higher economic conditions but also in a higher educational standard and improved sanitary conditions. While fully appreciating the success of many campaigns against mosquito larvae in various parts of the world, and particularly the results obtained by the use of Paris green, the Commission considers that there are only a few localities in Europe in which such measures would meet with sufficient success to warrant the large staff and great expense necessary for even a limited campaign. Among the regions visited, only two were found in which anti-larval measures had been carried out on a considerable scale with definitely successful results. These were in the Karst Mountains of Dalmatia, where the rainwater pools, which were carefully preserved by the inhabitants and proved to be sources of Anopheline breeding, were cleared out, lined with masonry and treated regularly with oil or Paris green, and in Palestine [*R.A.E.*, B, xiv, 55, etc.]. In Spain, great success is obtained with the fish, *Gambusia*, in pools used by cattle.

Perhaps the greatest essential in anti-malarial work is better housing conditions. Primitive huts should be replaced wherever possible with properly constructed houses affording as little shelter as possible to mosquitos, and as it is known that mosquitos prefer outhouses in which animals are kept to human dwellings, these should be located between the house and the chief breeding-grounds.

SELLA (M.). **I pesci larvifagi e l'esperimento di campagna antimalarica con le Gambusie a Rovigno d'Istria.** [Larvivorous Fish and the experimental antimalarial Campaign with *Gambusia* at Rovigno, Istria.]—*Riv. Malariol.*, vi, no. 6, pp. 881-909, 10 figs. Rome, November-December 1927. (With Summaries in Italian, pp. 1006-1007, French, pp. 1008-1009, English, pp. 1010-1011.)

A short account is given of the use in various parts of the world of fish against mosquito larvae. It is stated that the excellent results achieved by Valle & Sepulcri were obtained with *Alburnus lucidus* and not *Leuciscus erythrophthalmus* as recorded by them [*R.A.E.*, B, xiv, 176]. Larvicidal fish [*Gambusia*], introduced in 1922 into Italy from Spain, have thrived and have proved harmless to native species.

An anti-malarial campaign, based exclusively on the use of *Gambusia*, was conducted in 1926-27 in a district in Istria that abounds in Anopheline breeding-places, usually artificial watering pools. It was found sufficient to place only a few fish in a pool, as they increase rapidly, so that waters that dry up in the summer can be readily restocked yearly, the fish being introduced in autumn and not at the end of winter, to allow time for their increase. *Gambusia* can resist severe frost if able to shelter in mud, and the lack of mud is probably the reason why it has not survived the winter in some parts of Venetia. The fish are not very active in spring, and it may be necessary to clear away grass in the pools. Paris green may be employed as an additional measure, but it is not indispensable. *Gambusia* can live in water too salt for *Anopheles maculipennis*, Mg. (*claviger* auct.) and *A. sacharovi*, Favr (*clutus*, Edw.). It rarely lives for two years. The cost of using fish was one-third that of dusting with Paris green, and the results were satisfactory.

SEPULCRI (P.). **La malaria nell' Ongaro inferiore.** [Malaria in the Lower Ongaro Zone. *Riv. Malariol.*, vi, no. 6, pp. 910-934, 1 map. Rome, November-December 1927. (With Summaries in Italian, p. 1007, French, p. 1009, English, p. 1011.)

The Lower Ongaro zone of about 30,000 acres is one of the most malarious in Venetia. In spite of the very unfavourable conditions some improvement was noticed as a result of work done by the anti-malarial dispensary at Termine, which showed that greater success is attained if the quinine treatment of patients is accompanied by measures against Anophelines and their larvae.

LA FACE (L.) & SELLA (M.). **La zooprofilassi nella lotta antimalarica secondo le concezioni di B. Grassi.** [Zooprophylaxis in Malaria Control according to the Concept of Prof. B. Grassi.]—*Riv. Malariol.*, vi, no. 6, pp. 935–943. Rome, November–December 1927. (With Summaries in Italian, p. 1007, French, pp. 1009–1010, English, pp. 1011–1012.)

Arising out of Falleroni's paper on malaria in Italy [*R.A.E.*, B, xv, 182], a historical review is given of Grassi's views on the relation of domestic animals to Anophelines.

GRASSI (G. B.). **Lezioni sulla malaria.** [Lectures on Malaria.]—*Nuovi Ann. Agric.*, vii, pp. 153–280, 19 figs. Rome, 1927.

These lectures, which were delivered in 1924, constitute a complete survey of the various aspects of malaria, with particular reference to conditions in Italy.

HERRMANN (O.), KOLOSOV (Yu.) & LIPIN (N.). **Ist Parisergrün ein besseres Anopheles-Larvizid als Naphtha oder Petroleum?** [Is Paris Green a better Larvicide for *Anopheles* than Petroleum or Kerosene?]*Arch. Schiffs- u. Tropenhyg.*, xxxii, no. 3, pp. 140–143, 9 refs. Leipzig, March 1928.

In a previous article it was stated that Paris green cannot normally replace oiling [*R.A.E.*, B, xiv, 153], and this is confirmed by the observations of de Rook [*R.A.E.*, B, xv, 102] and others. In view of the opposite conclusion reached by many workers, further experiments have been made against Anopheline larvae in pools with Paris green, petroleum and kerosene. The Paris green was mixed with 100 or 500 parts of powdered clay, and its larvicidal effect proved inferior to that of the oils. It is therefore only suitable in places where mineral oils cannot be used, *i.e.*, in waters containing fish or used for watering cattle. Even then the poison dust often floats for days in thick bands, probably formed by wind action, so that poisonous doses are possible.

POPOV (P.). **Bemerkungen zu : L. Parrot, A propos de *Phlebotomus caucasicus* et de *Phlebotomus sergenti*.**—*Arch. Schiffs- u. Tropenhyg.*, xxxii, no. 3, pp. 147–149. Leipzig, March 1928.

Referring to comments by Parrot [*R.A.E.*, B, xv, 40], the author agrees that *Phlebotomus caucasicus*, Martz., which he still considers distinct from *P. sergenti*, Parrot, is confined to the Caucasus, Turkestan and Afghanistan.

PARROT (L.). **Phlébotomes d'Algérie.**—*C.R. Ass. franç. Av. Sci.*, 51st Session, pp. 256–257. Paris, 1927.

The five species of *Phlebotomus* known from Algeria [*cf.* also *R.A.E.*, B, xv, 113] are *P. perniciosus*, Newst., found in the littoral regions and

the high plateaux; *P. papatasii*, Scop., and *P. africanus*, Newst., in the northern Sahara; *P. fallax*, Parr., in the Sahara; and *P. sergenti*, Parr., known only from three localities in Constantine. *P. papatasii*, *P. perniciosus* and *P. sergenti* feed almost exclusively on warm-blooded vertebrates, particularly man, the other two species on reptiles. In October–December 1926, in collaboration with A. Donatien, the author bred *P. papatasii* from fertilised females taken at Biskra and transported to Algiers. In a damp atmosphere and at a mean temperature of 28° C. [82.4° F.] these females oviposited after 3–5 days. The eggs hatched after 9–11 days, and the larvae, fed on sterilised rabbit dung, pupated after 24–45 days, the adults appearing 10–12 days later.

VNUKOVSKIĖ (V.). **Mitteilung über die Culiciden-Fauna West-Siberiens.**
[Notes on the Culicid Fauna of West Siberia.] —*Zool. Anz.*, lxxvi,
no. 7–10, pp. 162–164. Leipzig, 15th April 1928.

This list of 18 species of mosquitos collected from various districts of West Siberia includes *Anopheles maculipennis*, Mg., and *A. hyrcanus*, Pall.

KOIDZUMI (M.). **On the Distribution of Anophelines in Formosa.**
[In Japanese.]—*J. Med. Soc. Formosa*, no. 272, pp. 215–233.
Taihoku, Formosa, November 1927. (With a Summary in English, p. 1.)

Formosa may be divided according to the distribution of Anophelines into six regions, viz., the central mountainous region, the southern, middle, and northern plains, the eastern region and the neighbouring islands. The species are most numerous in the lower part of the mountainous region (which has an altitude of up to 3,000 ft.), as many as 9 being found in one locality. *Anopheles lindesayi*, Giles (*pleccan*, Koidz.) and *A. jeyporiensis* var. *candidiensis*, Koidz., occur in the mountainous region only, the former having been found at an altitude of 7,000 ft. In the plains the species are most numerous near the mountainous region and the rivers. *A. ludlowi*, Theo. (*hatorii*, Koidz.) is common in the eastern region, and 4 or 5 species have been found in the neighbouring islands. *A. hyrcanus* var. *sinensis*, Wied., and *A. minimus*, Theo., are the most common in Formosa, being very widely distributed, while *A. maculatus*, Theo., is confined to the southern and central parts and is very common near the central mountainous region. *A. tessellatus*, Theo., the most important vector of malaria, is found chiefly in the plains, and *A. fuliginosus*, Giles, is rare in the northern part of the island and has never been found in the western region. *A. indiensis*, Theo. (*splendidus*, Koidz.), is distributed all over the island, but is comparatively rare. For the last 15 years, malaria has been rare in Taihoku, a fact that is accounted for by the extermination of *A. tessellatus* from the city, where, however, *A. hyrcanus* var. *sinensis* is still quite common.

KOIDZUMI (M.). **Notes on the Practice of Anti-malarial Work in Formosa.** [In Japanese.]—*J. Med. Soc. Formosa*, no. 272, pp. 234-247. Taihoku, Formosa, November 1927. (With a Summary in English, p. 1.)

The towns and villages in Formosa are classified into six groups, and the possibility of successful anti-malarial work under the conditions of each group is discussed.

FLETCHER (T. B.). **Report of the Imperial Entomologist. Pathological Entomology.**—*Sci. Rep. Agric. Res. Inst. Pusa 1926-27*, pp. 63-64. Calcutta, 1928.

In experiments on the oviposition of *Aedes (Stegomyia) albopictus*, Skuse, and *Culex fatigans*, Wied., infusions of hay, wheat, rice, oats, pulses and potatoes, diluted and allowed to rot, were found to be very attractive. Poisoned infusions proved as attractive as the plain ones and more so than stagnant and distilled water, which were used as controls, although the chemicals had a marked effect on the larvae and often caused their early death.

Larvae of the Dytiscid beetle, *Hyphoporus aper*, Sharp, were observed to attack both Culicine and Anopheline larvae, but not the eggs or the pupae, in the river at Pusa.

PAPERS NOTICED BY TITLE ONLY.

[PAVLOVSKIÏ (E. N.) & STEIN (A. K.).] Павловский (Е. Н.) и Штейн (А. К.). **Investigations on the Toxicity of the Hairs of Hibernating Larvae of *Nygmia phacorrhoea*, Don. (*Euproctis chrysorrhoea*, auct.) to the Human Skin.** [In Russian.]—*Défense des Plantes*, iv, no. 4-5, pp. 596-606, 4 figs., 2 refs. Leningrad, November 1927.

GALLAGHER (B. A.). **Diseases of Poultry.**—*Fmrs.' Bull. U.S. Dept. Agric.*, no. 1337, revised, 30 pp., 15 figs., 4 refs. Washington, D.C., October 1927. [Cf. *R.A.E.*, B, xii, 67.]

PINTO (C.). ***Cimex limai* n. sp., parasita de morcêgos do Brasil.** [*C. limai*, sp. n., a Parasite of Bats in Brazil.]—*Bol. biol.*, no. 10, pp. 186-187, 4 figs. S. Paulo, 15th December 1927.

HEARLE (E.). **List of Mosquitoes of British Columbia recorded to December 31, 1926.**—*Proc. Ent. Soc. B. C.*, no. 24, pp. 11-19, 9 refs. Victoria, B.C., 1927.

KRÖBER (O.). **Neue palaearktische Tabaniden.** [New palaearctic Tabanids.]—*Zool. Anz.*, lxxvi, no. 11-12, pp. 261-272, 13 figs. Leipzig, 1st May 1928.

ENDERLEIN (G.). ***Cnetha wigandi*, eine neue Simuliide aus dem Leinegebiet.** [*Simulium* (C.) *wigandi*, a new Simuliid from the Leine District.]—*Zool. Anz.*, lxxvi, no. 11-12, pp. 315-317, 2 figs. Leipzig, 1st May 1928.

GIVEN (D. H. C.). **Health Organization on H.M. Naval Base, Singapore, and Results: with Comments on the Practice of Preventive Medicine seen during Tours in the Far East.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xxi, no. 5, pp. 344–370, 2 graphs. London, 25th February 1928.

A brief review is given of the health conditions among the labourers working on the construction of the Naval Base at Singapore, from July 1925 to July 1927. Despite precautions, which included drainage and reclamation work and the exclusion of malaria carriers in the selection of coolies, malaria was the chief cause of sickness, but its incidence never caused real anxiety; only 195 fresh infections and 34 relapses occurred in the two years, the average strength of the labour force being 575 for the first half year and 1,000 for the remainder of the time.

The prevalence of malaria in Malaya generally was exceptional in 1926, the incidence reaching altogether abnormal heights from April to September. The rainfall for the first half year was much below the average, a condition favourable to *Anopheles maculatus*, Theo., and, in the coastal zone, to *A. ludlowi*, Theo. These are the mosquitos chiefly responsible for malaria in the driest months (generally beginning about May); the other season of malarial prevalence in Malaya is during the wettest months (generally November to January), when the vector is *A. umbrosus*, Theo. A graph of the monthly incidence of malaria illustrates the seasonal prevalence at the Base up to July 1926, but after that time, when a native village close to the site was evacuated, there was no further evidence of seasonal incidence. It is believed that after January 1926 practically no malaria was acquired in the coolie lines, where Anophelines were very rarely found, all breeding-places within half a mile having been eliminated. Two series of cases occurred among gangs working in swamps where Anophelines were breeding, in one case *A. umbrosus* and in the other *A. maculatus*. The author considers that these facts justify the view that the vectors of malaria in Malaya are not domestic species. Similar observations have been made by Doorenbos in Sumatra [*R.A.E.*, B, xv, 110] where the infection rate has been found to be higher among wild Anophelines than among those captured in coolie lines.

For comparison with the data for the Singapore Naval Base, a graph is given showing the monthly malarial incidence among the police and the rainfall in the mainland parts of the Colony of Hong-kong from 1923 to 1925. The curve of malarial incidence has two peaks, one in the dry season (October to March), when the carrier is *A. maculatus*, and the other at the height of the rains, when the two common Anophelines are *A. minimus*, Theo., and *A. hyrcanus* var. *sincensis*, Wied., although the carrier at this season has not been determined. On Hongkong Island the chief carrier is *A. maculatus*, which breeds in rocky ravines that become more favourable to it immediately the rains subside, and the peak of malarial incidence among troops occurs two months after the rains.

The vectors of malaria in Africa and Asia are briefly discussed, and it is shown that the Anophelines chiefly responsible become more specific in their breeding habits, and that malaria tends to become more localised in consequence, from west to east. In Africa the principal vector, *A. gambiae*, Giles (*costalis*, Theo.), is the most prevalent and domesticated Anopheline, and breeds in almost any

collection of water that is exposed to sunlight at some part of the day. In India and Ceylon the principal vectors are *A. culicifacies*, Giles, and *A. listoni*, List.; in Ceylon there is a large area in the south-west, comprising the low-lying tidal zone, where these two species are scarce or absent and where malaria is negligible, while it is most intense in the lower foot-hills, where *A. listoni* is prevalent [cf. R.A.E., B, xvi, 29-32]. In the Dutch East Indies, the tidal zone is the most malarious, as *A. ludlowi*, which is the most important vector, breeds in brackish water. In Malaya the chief vector is *A. maculatus*, which breeds in clean, well-aerated moving water exposed to abundant sunshine; although tidal swamps are as conspicuous a feature of Malaya as of the Dutch East Indies and *A. ludlowi* is present all the year round in the neighbourhood of Singapore, it is not there a vector of the same importance. In Hongkong and Formosa *A. maculatus* is the most important vector. Less important vectors are: in Africa, *A. funestus*, Giles; in India and Ceylon, *A. maculatus*; in Malaya, *A. aconitus*, Dön., *A. umbrosus* and *A. ludlowi*; in the Dutch East Indies, *A. maculatus*, *A. aconitus*, *A. minimus*, *A. umbrosus*, *A. kochi*, Dön., *A. hyrcanus* var. *sinensis* and *A. leucosphyrus*, Dön.; and in Hongkong and Formosa, *A. minimus* and *A. hyrcanus* var. *sinensis*.

One of the important problems of malarial research is to discover what makes an Anopheline a suitable host for the malaria parasite, and why one species may be a host in one country but not in another, or experimentally but not in nature, as is the case with *A. karwari*, James, which is prevalent in Malaya and a good experimental vector but does not transmit malaria in nature. Another problem is presented by anomalies with respect to altitude. Malaria generally disappears at altitudes of 4,000-5,000 feet throughout the tropics, but it has been recorded at 9,000 feet in the Himalayas, and *A. maculatus* is a vector at Shillong, Assam, at 6,000-7,000 feet, while at Kandy, Ceylon, at 1,200 feet, *A. maculatus* is present but there is no malaria. The relation of water insects to mosquito larvae should also be studied.

A section of the paper is devoted to contrasting the systems of estate sanitation in the Dutch East Indies and Malaya; one outstanding feature of the Dutch system is the extent to which the coolies are under the control of the medical authorities, so that when sick they are not allowed to remain on the plantations where they are a source of infection. It is suggested that labour on all estates should be medically selected in order to exclude malaria carriers, and that the Government should be responsible for the treatment of rejected cases.

Notes are given on the control of the domestic species of Culicines and the need for propaganda to this end in the tropics. The commonest and most widely distributed species in the East are *Aedes (Stegomyia) argenteus*, Poir. (*fasciatus*, F.), which is the carrier of dengue, *A. (S.) albopictus*, Skuse (*scutellaris*, Theo. nec Wlk.), *Culex fatigans*, Wied., and *Armigeres obturbans*, Wlk. A list is given of seven species of Culicines that are widely distributed in the East and that fly into houses from distant breeding-places; most of these are being eliminated from towns in the course of anti-malarial operations.

In the discussion that followed the reading of this paper it was stated that from £10,000 to £12,000 had been spent on anti-malaria work at the Singapore Naval Base up to the end of 1927, but that this included the clearing of swamps, which would have had to be done

in any case ; it was estimated that the annual wages bill at the Base would have been £5,000 higher if malaria had not been controlled. With regard to the type of malaria, the author stated that benign tertian and malignant tertian cases occurred in about equal numbers, taking the whole period into consideration, malignant tertian being most conspicuous when malaria was most intense.

SHARP (N. A. D.). *Filaria perstans* ; **its Development in *Culicoides austeni***.—*Trans. R. Soc. Trop. Med. & Hyg.*, xxi, no. 5, pp. 371-396, 9 figs., 1 chart, 38 refs. London, 25th February 1928.

Filaria (Dipetalonema) perstans is known as a parasite of man in tropical Africa, Algeria, Tunis, British Guiana and New Guinea, but its principal area of infection is in and around the Congo basin, which is the main habitat of the gorilla and chimpanzee, from both of which animals it has been recorded. In some parts of Africa infection with *F. perstans* is very common ; the author found larvae in the blood of 92 per cent. of several hundred natives of the forest area of the Cameroon, and he considers it probable that every adult in the area is infected. There is uncertainty as to whether the Nematode is pathogenic to man or not, but the author is of the opinion that there is good reason to hold it partly responsible for the production of lymphatic varices of the groin.

The observations of previous workers have made it almost certain that mosquitoes are not the vectors of *F. perstans*, and the fact that Europeans, who always sleep under mosquito nets, are very rarely infected led the author to suspect that it is transmitted by *Culicoides austeni*, C. I. & M., since this midge is common in the Cameroon in the wet season, from June to the beginning of November, and bites only in the dark, mainly between 10 p.m. and 2 a.m. A lamp giving one-quarter of a candle power light placed in a tent 7 ft. long tended to keep the flies away, and a full moon gave almost complete protection from them. Flies in captivity were induced to bite during the day by offering them an arm in a dark cage, but even in darkness the white arm of the author was not bitten by midges that immediately afterwards bit the black arm of his native servant. Only the females of *C. austeni* bite, and it is probable that they require two blood feeds, the second usually on the third day and not later than the fourth day, for ovulation to be completed. Ten flies oviposited on the sides of test-tubes, laying from 92 to 141 eggs each ; another feed of blood was readily accepted after oviposition. The eggs hatched in from 40 to 100 hours, mostly on the fourth day. In the course of dissecting 540 specimens of *C. austeni*, ciliates were found three times and flagellates on a number of occasions. More than a dozen individuals had a mite resembling *Sarcoptes (Acarus) scabiei*, DeG., on their legs or bodies, a fact that is of interest in conjunction with the observation that the midge would bite for choice in or around the burrow of a mite or in the ulcerated surface produced by scabies.

Experiments to test the ability of *F. perstans* to develop in *C. austeni* were carried out from September to November 1926 and in June and July 1927, the midges being collected from the sleeping-tent of a native whose blood contained large numbers of *F. perstans*, and whose skin was infested with *Onchocerca volvulus* and *Agamofilaria streptocerca*. *A. streptocerca* was never found in the stomach blood of *C. austeni*, and *O. volvulus* only once, when the embryo remained unchanged four days

after the infecting feed of the midge, while embryos of *F. perstans* had developed normally. Great difficulty was experienced in keeping the midges alive for more than about three days, but finally a method was devised by which they could readily be kept for 10 days. They were placed on the day of capture in a silk bag stretched over a wire frame and closed at one end with a string, so that an arm could be introduced on which they could be fed. The other end was covered with moist cotton wool and wrapped in a black cloth, and a piece of cotton wool soaked in honey water was attached to the dark end of the frame and a small vessel containing muddy water and algae was suspended from a transverse wire. Midges kept in this way were given a second feed of blood from 3 to 7 days after the infecting feed.

The development of *F. perstans* in *C. austeni* and the spontaneous emergence of the Nematode from its proboscis are described in detail. Within a few minutes of ingestion, the activity of the larvae increases greatly, and after six hours, during which time the first ecdysis has taken place, they lie either in the stomach wall or in the fat body. Fifteen hours after ingestion, the larvae are sluggish and may have reached the thoracic muscles, while most have reached the thorax in 20–30 hours, and have come to rest in the wing muscles or round the extensor muscles of the legs. By the seventh day the larvae are more active again and have reached the head and neck of the midge; no perceptible further increase in size takes place after the seventh day, when emergence may occur, although this more usually takes place on the eighth and has also been observed on the ninth and tenth days. The larvae escape from the proboscis by stretching and finally bursting the terminal membranous portion of the labrum, apparently regardless of whether the midge is feeding or not. The passage of a larva through the human skin was not observed, but there is strong presumptive evidence that *C. austeni* is an efficient vector of the Nematode from man to man. A few specimens of *Culicoides grahamsi*, Aust. [with which *C. austeni* had previously been confused, *R.A.E.*, B, xvi, 14] were captured, and development of *F. perstans* was observed in two of them up to the third day; it is probable that this species will also prove to be a natural vector of the parasite.

The dissection of 227 specimens of *C. austeni* within 15 hours of their capture showed an infection rate of 7 per cent. in wild midges, but the actual rate is probably higher, as only those that showed a second day form of *F. perstans* were considered.

GARNHAM (P. C. C.). **Susceptibility of *Ornithodoros* to Fire.**—*Kenya Med. J.*, iii, no. 9, pp. 265–266. Nairobi, December 1926.

The author has found burning to be the most effective method of exterminating *Ornithodoros moubata*, Murr., in native thatched or grass-roofed huts in Kenya. Either the roof is set on fire and allowed to fall in or the roof is removed first, placed inside the hut and then set on fire, grass being piled above the tops of the walls, to a height of about 10 feet. In an experiment to test the efficacy of this method a number of active individuals of *O. moubata* were placed in holes in the floor varying in depth from $\frac{1}{2}$ to $3\frac{1}{2}$ inches and covered with earth, which was then firmly stamped down, and one was placed in a crack one inch deep in the wall. The grass was then put inside the hut and set on fire; on the following day all the ticks except those in a hole $3\frac{1}{2}$ inches deep near

the wall were found dead in their original positions, those near the centre of the hut being more charred than those near the walls. The ticks are rarely found at a greater depth than 3 inches in cracks and holes.

LAMBORN (W. A.). **Medical Entomologist's Annual Report for 1926.** — *Ann. Med. Rep. Nyasaland 1926*, pp. 24–31. Zomba, 1927.

One of the most important features in the bionomics of *Glossina* that still remain to be elucidated is the occasional restriction of the fly to certain localities; as an instance of this the distribution of *G. morsitans*, Westw., along the southern end of the western shore of Lake Nyasa is described. For the first 25 miles, up to a low range of hills, only an occasional tsetse-fly may be found, but further north the fly is much in evidence, although the nature of the woodland, the fauna and the geological formation are the same throughout. In spite of the fact that *G. morsitans* is most active in the hotter hours and at the hottest season, numerous observations in nature and experiments have failed to afford any evidence that it drinks water; for the most part it favours tracts of comparatively arid country. The author discusses further arguments in favour of the suggestion that the flies, or at least the males, ingest water or some other liquid such as plant sap containing a large percentage of water, in addition to blood. It was thought that the flies might obtain liquid from some plant growing only in certain localities, but all observations and experiments to test this hypothesis have so far proved negative. The spread of the fly in certain areas also requires explanation; two instances are cited in which it appears that the only explanation is that the elimination of game in adjacent areas has caused the dispersal of the fly in search of food, although game is almost absent from the areas into which it has spread. The rate of parasitism of the puparia in one of these areas was found much the same as in an area where no spread has taken place.

The possible significance of a musical note produced by both sexes of *G. morsitans* is discussed. Experiments have shown that it does not appear to be a warning of the presence of natural enemies, nor does it appear to have any connection with the proximity of prey. It is suggested that it may provide a means by which a fly separated from the main body may regain its fellows. It is proposed to carry out experiments with an apparatus capable of producing the note. In view of a suggestion that virgin female tsetse-flies might be used to attract males, the author states that he made experiments to test this possibility some years ago, but that the results were negative.

Ornithodoros, *Cimex* and larvae of *Auchmeromyia* all gave negative results in attempts to transmit various types of trypanosomiasis of animals either directly or up to intervals of 42 days.

Details are given of the work carried out in the latter part of 1926 in two adjacent districts in the Central Province for the control of *Glossina morsitans* by intensive settlement at the points where the fly area is extending southwards and rapid deforestation to a depth of about 1,000 yards in the direction of the fly country. Thirteen villages with a total of 443 huts were disposed over a stretch of about 8 miles in one district and 12 villages with a total of 500 huts over a rather shorter distance in the other, the greatest distance between any two adjacent villages being 600 yards. The operations have been received with satisfaction by the natives. There had been a general withdrawal of the larger game animals to the north of the line of settlement, followed

by some diminution in the numbers of *G. morsitans*. Data on the number of flies caught by a gang of collectors during the last six months of the year show that there has been some diminution immediately to the north of the line of the settlement that was begun first (9th August), but an increase in the country to the south of the line, which was invaded by the fly during the year; the increase may be attributed partly to the normal seasonal increase and partly to the flies having been repelled to the south as well as to the north of the line. In all catches males greatly predominated.

BECQUET (A.). **Noms indigènes de la tsétsé.**—*Rev. zool. afr.*, xv, fasc. 4, p. [90]. Brussels, 15th February 1928.

A list is given of the native names for *Glossina palpalis*, R.-D., in the Kasai and Lomami regions of the Belgian Congo.

LAVIER (G.). **Existence d'individus naturellement "ablépharoplastiques" dans les souches de trypanosomes du groupe *brucei* récemment isolées.**—*C. R. Soc. Biol.*, xcvi, no. 35, pp. 1611-1613. Paris, 16th December 1927.

LAVIER (G.). **Rôle uniformisant de l'hôte vertébré dans la morphologie des trypanosomes du groupe *brucei*.**—*Op. cit.*, xcvi, no. 7, pp. 520-522, 4 refs. 24th February 1928.

In studying a number of recently isolated strains of *Trypanosoma brucei*, *T. gambiense* and *T. rhodesiense* in laboratory animals in Uganda the author found that in every case there occurred a certain number of forms without a parabasal body; these forms were also present in a naturally infected dog in an area infested with *Glossina morsitans*. In experimentally infected animals the forms appear shortly after the first trypanosomes, after which their proportion increases rapidly for several days and then remains more or less constant until the death of the animal. Some of these forms may be produced by the atrophy of the parabasal body, but most of them are the result of unequal growth of different parts of the trypanosome during periods of very active division. The forms without a parabasal body divide in the normal way, producing similar forms. The proportion of these forms present in an animal after it has become constant differs according to the source of the strain, being 1-2 per cent. for two human strains of *T. rhodesiense* originating from *Glossina swynnertoni*, 0.5-2 per cent. for seven human strains of *T. gambiense* originating from *G. palpalis* and for *T. brucei* 1-2 per cent. for a strain originating from *G. palpalis*, 6-10 per cent. for one from *G. morsitans* and 5.8-9.4 per cent. for one from *G. swynnertoni*.

In the second paper the author points out that when a guinea-pig is inoculated with blood from a man or animal naturally infected with a trypanosome of the *T. brucei* group, the main characteristic of which is polymorphism, trypanosomes appear after an incubation period of 2-5 weeks, and after a further two weeks these are very polymorphic and division is so rapid that forms without nuclei [*R.A.E.*, B, xvi, 16] or without parabasal bodies appear. This phase does not last for more than about two weeks, after which the only forms without parabasal bodies are those resulting from the division of those first produced; the forms without nuclei disappear, division is regular

and complete, and the size of the trypanosomes is much less variable. After three or four months polymorphism is greatly reduced. After continued passage through laboratory animals in Europe for a year or more, a trypanosome of the *T. brucei* group loses its polymorphism. The author concludes that the vertebrate host exerts a regulatory influence on the morphology of the trypanosome, because its protective reaction eliminates the divergent elements, but that the factors that make for variation take effect during the phase passed in the invertebrate host, which offers less protection against the variations of the external medium.

CHANNON (H. A.) & WRIGHT (H. D.). **Observations on Trypanosomiasis of Rabbits and its natural Mode of Transmission.**—*J. Path. & Bact.*, xxx, no. 2, pp. 253-260, 1 fig., 15 refs. London, April 1927. (Abstracts in *Trop. Dis. Bull.*, xxiv, no. 7, pp. 591-592, and *Trop. Vet. Bull.*, xv, no. 3, p. 99. London, July & September 1927.)

The morphology of *Trypanosoma nabiasi*, found in the blood of a domestic rabbit, is described, and an account is given of its mode of transmission by the rabbit flea, *Spilopsyllus cuniculi*, Dale (*leporis*, Leach). Healthy rabbits were in most cases infected by intravenous inoculation of infected blood, but subcutaneous and intraperitoneal inoculations gave negative results in the few cases in which they were tried. Injection of infected fleas also produced infection. The development of the trypanosome takes place in the digestive tract of the flea, and resembles that of *T. lewisi* in the rat flea [*Ceratophyllus fasciatus*, Bosc] [*R.A.E.*, B, iii, 74]. Infection follows ingestion of infected fleas by rabbits, but is not caused by the bites of fleas. The incubation period is seven days. Infected rabbits recover and remain immune from fresh infection for at least six months. Attempts to infect rats, mice and guineapigs failed.

NICOLLE (C.) & ANDERSON (C.). **Sur la présence au Maroc du spirochète de la fièvre récurrente espagnole.**—*C.R. Acad. Sci. Fr.*, clxxxvi, no. 15, pp. 991-992. Paris, 1928.

Spanish relapsing fever [caused by *Spirochaeta hispanica*], the vector of which is *Ornithodoros maroccanus*, Velu, has not hitherto been identified in Morocco. The tick is generally found in association with pigs, which are not affected by the spirochaete [*R.A.E.*, B, xvi, 19], the small mammals, particularly rodents, found on farms being probably the reservoirs of infection. In experiments with examples of *O. maroccanus* obtained at a depth of 8-16 inches under the soil of a pig farm, near Casablanca, abandoned over six years previously owing to tick infestation, the authors found no infected ticks among those received in June and July 1926. Sixty ticks received in December 1927 were divided into 5 lots, 4 of which, comprising 50 ticks, were uninfected, but a rat exposed to the remaining 10 ticks became infected with a spirochaete, which closely resembled *S. hispanica*. Both spirochaetes are highly pathogenic to guineapigs (the Moroccan one somewhat more so) and are alike in their reactions to cross immunity tests, so that they must be presumed to be the same species. Spanish relapsing fever may therefore occur in Morocco as well as the form [*S. recurrentis*] transmitted by lice [*Pediculus*]. It should chiefly be looked for among

persons connected with pigs. On the other hand, if spirochaetes are found in *Ornithodoros* near pig farms, they should also be looked for in the small mammals of the district. It is extremely probable that the spirochaetes in the ticks from Casablanca were recently acquired from small mammals on the site of the abandoned pig farm.

NICOLLE (C.), ANDERSON (C.) & COLAS-BELCOUR (J.). **Sur un spirochète sanguicole nouveau (*Sp. normandi*), transmis par un ornithodore (*Orn. normandi*), hôte des terriers de rongeurs nord-africains.**—*Arch. Inst. Pasteur Tunis*, xvii, no. 1, pp. 1-34. Tunis, March 1928.

This paper is a continuation of studies on *Spirochaeta normandi*, the spirochaete recently discovered in *Ornithodoros normandi*, Larr., at Kef [R.A.E., B, xvi, 2], to which, in addition to the white mouse, a wild mouse, *Mus spretus*, has proved susceptible. In laboratory experiments, as in natural transmission, infection in the gerbille, *Meriones shawi*, is shown only by the rare presence of spirochaetes in the blood. The white rat and the rabbit are less susceptible, while the guineapig, dog, goat, pigeon and a lizard could not be infected. *S. normandi* is distinguished from the spirochaete of Spanish relapsing fever [*S. hispanicum*] by its lack of pathogenicity for the guineapig, and from it as well as from *S. duttoni* and *S. crocidurae* by its slight pathogenicity for the rat. In monkeys it causes a relapsing fever characterised by the presence of numerous spirochaetes, but in man the infection is latent, without feverish symptoms or spirochaetes. The blood of an infected man is virulent to the mouse during the period of infection. In contradistinction to *S. normandi*, *S. recurrentis* (*obermeieri*) is characterised by attacks of fever and the presence of numerous spirochaetes in man, while it is slight and fugitive in the mouse.

Spirochaetes similar to *S. normandi*, and reacting in the same manner on the white mouse, *Mus spretus*, the rat and the gerbille, have been discovered in *O. normandi*, in burrows and upon *Meriones shawi* in the neighbourhood of Carthage. This spirochaete, like that from Kef, does not infect guineapigs, but cross-immunity experiments with mice indicate that the two spirochaetes are not absolutely identical, though closely allied, and may be considered as two varieties of the same species. *Ornithodoros normandi* is frequently accompanied in burrows in the Carthage region by *O. erraticus*, Lucas. No case of natural infection in this tick has yet been observed, nor has it yet been discovered at Kef. There is, however, no doubt that *Meriones shawi* is the vertebrate reservoir of the spirochaete both at Carthage and at Kef.

COLAS-BELCOUR (J.). **Note sur *Ornithodoros normandi*, ses caractères différentiels et sa biologie.**—*Arch. Inst. Pasteur Tunis*, xvii, no. 1, pp. 35-39, 1 pl. Tunis, March 1928.

The distinguishing characters of *Ornithodoros normandi*, Larr., are briefly described. As the gerbille, *Meriones shawi*, on which it normally feeds, is often found burrowing in the neighbourhood of human habitations, it may be supposed that the ticks are in frequent proximity to man, on whom it has been proved that they can feed [R.A.E., B, xi, 146]. The burrows of the gerbille are described, and the incidence

of the ticks within them is discussed. *O. normandi* only remains in contact with its host while feeding, and at other times it hides under rubbish in the burrows. The ticks may also feed on other animals found in the burrows, such as *Mus spretus* or reptiles and amphibia, or may possibly even prefer these hosts while in the larval stage. In a highly infested burrow, ticks were found in all the galleries, but particularly under the deposits in the most remote part of the burrow known as the nest, together with numerous other invertebrate parasites such as fleas, mites and Coleoptera. The geographical distribution of *O. normandi* has not yet been determined. In Tunis it has been found at Kef, Gabès and Carthage, in which place it was associated with *O. erraticus*, Lucas, a species closely allied to *O. marocanus*, Velu. The distinguishing characters of these ticks are indicated.

The method of collecting the ticks from the burrows and of breeding them in the laboratory, where they are kept in tubes stopped with cotton wool and fed on *M. shawi*, is described. An effort to feed the adults on *Rana esculenta* failed.

GILTNER (L. T.). **Anaplasmosis of Cattle in the United States.**—*J. Amer. Vet. Med. Ass.*, lxxii (N.S. xxv), no. 6, pp. 919-932, 10 refs. Detroit, Mich., March 1928.

A review is given of the literature on anaplasmosis of cattle, and the geographical distribution, symptoms and effects, and treatment of the disease are discussed. In one district in California, during the winter of 1926-27, the ticks, *Dermacentor reticulatus occidentalis*, Marx (western dog or wood tick) and *Ixodes ricinus californicus*, Banks, the common deer and cattle tick of California, were found on cattle infected with the disease. In parts of Florida, where the author's observations were made, the disease was very virulent in 1927 and in some instances caused a loss of 30 per cent. of the herd; cases were first noticed on 1st June but only became prevalent in August. The disease has been transmitted experimentally in various parts of the world by *Boophilus* (*Margaropus*) *annulatus decoloratus* Koch, *B. annulatus microplus*, Can., *Rhipicephalus simus*, Koch, and *I. ricinus*, L., but the only tick found on the cattle in Florida was one example of the last-named. The disease occurs in the United States in tick-free areas, and it is therefore suggested that it may be transmitted by biting flies, notably *Tabanus atratus*, F. The author, however, injected a calf with a suspension of a number of these flies taken on the infected cattle with negative results.

Symposium on Tick Eradication.—*J. Amer. Vet. Med. Ass.*, lxxii (N.S. xxv), no. 6, pp. 932-946. Detroit, Mich., March 1928.

At a conference held at Chicago in December 1927 the following papers were read on the progress of eradication of the cattle tick *Boophilus annulatus*, Say:—What Tick Eradication is doing for the Cattle Industry in Florida, by J. V. Knapp; Completion of Tick Eradication in the Old Dominion State, by S. H. Still; and Tick Eradication Methods found successful in Arkansas, by W. A. McDonald, the subject being concluded by the Report of the Committee on Tick Eradication.

Prior to 1923, when the present State Live Stock Sanitary Board came into existence, very little was done in this connection in Florida.

There is not sufficient winter food available in the State to support the number of cattle that might otherwise be reared, and it is therefore proposed to raise calves that are marketable in the autumn and early winter. This has already been successfully done in areas where tick eradication has been completed. Tick eradication will of itself permit the introduction of pure-bred bulls, which are necessary for the production of these calves, and it is believed that the value of the cattle industry in the State can be doubled in this way. In this State an inspection is made of the cattle every two weeks over a period of at least two years, the owners being forced to pay for the dipping of any animals they have omitted to treat.

Systematic tick eradication was completed in Virginia in December 1927, and only local quarantines are now being enforced; the work was conducted under close supervision, the regulations being similar to those in Florida and carried on over a sufficient length of time to eradicate the tick. Large swamps inhabited by wild cattle heavily infested with ticks were freed from infestation by slaughtering the animals and keeping the areas vacant long enough for the danger of infestation to be removed.

The same method of dipping is carried out in Arkansas as in the two States mentioned above, and by this means the work is completed in one season between 1st March and 1st December.

In the report of the tick eradication committee it was stated that several large districts in the quarantined area in Louisiana were flooded by the Mississippi, the domestic animals being drowned in some localities, so that all the ticks were destroyed, and in some cases arrangements were made to restock these areas with tick-free animals only.

The Story of the Cattle-fever Tick. What every Southern Child should know about Cattle Ticks.—*Misc. Pub. U.S. Dept. Agric.*, no. 2, revised, 19 pp., 26 figs. Washington, D.C., September 1927.

This is an account in simple language of the life-history, economic importance and eradication of the cattle tick [*Boophilus annulatus*, Say], which is the only vector of Texas fever of cattle in the United States.

COOLEY (R. A.) & KOHLS (G. K.). **Egg-laying of *Ixodiphagus caucurtei* du Buysson in larval Ticks.**—*Science*, lxvii, no. 1748, p. 656. New York, N.Y., 29th June 1928.

In laboratory experiments in Montana about 350 fed larvae of *Dermacentor venustus*, Banks (*andersoni*, Stiles) were placed with about 90 males and females of the introduced Chalcid, *Ixodiphagus caucurtei*, du Buysson, in a small glass jar at room temperature in direct sunlight on 20th August 1927. The larvae were then kept at a temperature of 19° C. [66·2° F.], and by 22nd September all had become nymphs, which were placed in a longevity tube out of doors. On 11th November they were placed on a rabbit in the laboratory for feeding, and 78 fed nymphs were later recovered. These were kept at 19° C., and examined from day to day. On 5th December a few showed the usual mottled appearance characteristic of parasitism, and 32 nymphs were eventually isolated as parasitised. Nine of these gave

adult parasites. In the conditions stated therefore, *I. caucurtei* deposits eggs in fed larvae, the development of the eggs being delayed, as opposed to the case of eggs deposited in nymphal ticks, when development of the parasite begins promptly. The living parasite is carried through the quiescent period of the fed larva and is alive in the next stage. The parasite may remain alive through a resting period of the unfed ticks prolonged for 50 days and, on the nymphs being fed, the parasites will develop to maturity. These results suggest the possibility of a more or less established adaptation, which had not been previously suspected.

SERGEANT (Edm.), DONATIEN (A.), PARROT (L.), LESTOQUARD (F.) & PLANTUREUX (E.). **Etudes expérimentales sur les piroplasmoses bovines d'Algérie (deuxième mémoire). Deuxième partie.** *Ann. Inst. Pasteur*, xii, no. 11, pp. 1175-1188, 3 figs. Paris, November 1927. **Les piroplasmoses bovines d'Algérie. Deuxième mémoire. Méthodes de prémunition.**—*Arch. Inst. Pasteur Algérie*, v, no. 3, pp. 245-468, 58 figs., 23 refs. Algiers, September 1927.

The first paper concludes an account of experiments on the production of premunition against piroplasmosis in cattle in Algeria [*R.A.E.*, B, xvi, 17 with a summary of the work carried out in the field from 1924 to 1927. The second paper gives full details of both the laboratory and field work. In the four years 954 premunised cattle and 132 untreated cattle were exposed to natural infection by ticks in the field; of the untreated animals 38 per cent. died of piroplasmosis, while of the premunised ones the number that died of piroplasmosis each year varied from 4 per cent. in 1924 to 0.6 per cent. in 1927. From 8 per cent. (in 1925) to 0.4 per cent. (in 1927) died as a result of the inoculation. Premunition against the four pathogenic piroplasms of cattle in Algeria can be produced in two operations, with an interval of three months between them. Although the resistance of premunised animals is presumably kept up by natural re-inoculation by ticks, it is advisable to repeat the inoculations each year, particularly for animals moved to new pastures or those that spend part of the year in cow-sheds. Three cases are recorded of calves becoming infected with *Theileria dispar* in cow-sheds, presumably by ticks carried in fodder.

[The authors use the term "premunition" to express the resistance to a superimposed infection that exists during a chronic infection in certain diseases, such as malaria, trypanosomiasis, piroplasmosis, etc., but ceases when all the parasites causing the disease have disappeared from the body. In contradistinction to this, true immunity, which exists in certain other diseases, is permanent, even after the causal organisms have disappeared.]

COX (O. H.), CARRION (A. L.) & FOX (C.). **Rat-flea Survey of the Port of San Juan, Porto Rico—a preliminary Report.** *Publ. Hlth. Rep.*, xliii, no. 11, pp. 611-616, 2 charts. Washington, D.C., 16th March 1928.

In this report the results are given of a rat-flea survey carried out in San Juan from July 1926 to June 1927, during which time 360 live rats were trapped, from 193 of which 2,575 fleas were obtained. Of these fleas 2,539 were *Xenopsylla cheopis*, Roths., 35 *Echidnophaga*

gallinacea, Westw., and 1 *Ctenocephalus canis*, Curt. Of the rats 287 were *Mus (Rattus) norvegicus*, 41 *M. (R.) rattus* and 32 *M. (R.) rattus alexandrinus*. The percentage of rats infested and the average number of fleas per rat were 83 and 8·6 for *M. rattus*, 66 and 4 for *M. rattus alexandrinus* and 48 and 7·3 for *M. norvegicus*. These figures, for all rats captured, were higher in the dock area (85·7 and 14·4) than in any other part of the city. Climatic conditions are favourable for the breeding of *Xenopsylla cheopis* throughout the year in San Juan, but there was a sharp rise in the number of fleas per rat, corresponding with a sharp rise in humidity and a rise in temperature in May and June.

THEODOR (O.). **On the Occurrence of a non-pathogenic Trypanosome in the Goat and its Transmission by *Lipoptena caprina* Austen. (Preliminary Note).**—*Trans. R. Soc. Trop. Med. & Hyg.*, xxi, no. 6, pp. 489–490. London, 31st March 1928.

Flagellates, both trypanosome and crithidial forms, have recently been found in cultures of the blood of a goat and in the gut of the Hippoboscid, *Lipoptena caprina*, Aust., with which it was heavily infested, in Palestine. Experiments show that the flagellates are acquired by the flies from the goat, and that hereditary transmission in the flies does not occur. Flagellates similar in every way to those obtained in culture from the naturally infected goat were found in cultures taken from a young goat fed on an emulsion of wild specimens of *L. caprina*, 11 days after the last feed.

DI DOMIZIO (G.). ***Trypanosoma cazalboui* e *Trypanosoma vivax* nella Somalia Italiana. Relativa tripanosi detta Gobiati.** [*T. cazalboui* and *T. vivax* in Italian Somaliland and the corresponding Trypanosomiasis called Gobiati.]—*Nuova Vet.*, iii, nos. 11–12, pp. 297–309, 329–341, 9 figs., 3 pls., 19 refs. Bologna, 15th November and 15th December 1925.

The trypanosomes occurring in domestic animals in Italian Somaliland include *Trypanosoma congolense* (*dimorphon*) in bovines; *T. brucei* in equines; and *T. evansi* in camels. In addition, there is an important bovine trypanosomiasis, "gobiati," due to *T. cazalboui* associated with *T. vivax*, from which the author considers it to be distinct. One experiment was made with *Glossina pallidipes*, Aust., a slight infection being obtained in calves and a donkey on which wild flies were allowed to feed. Natural infection may occur in equines and camels, but is negligible and masked by the forms of trypanosomiasis peculiar to them. Gobiati is transmitted mainly by *Stomoxys*, though *G. pallidipes*, the only tsetse-fly found in Italian Somaliland, plays a minor part. Its distribution is, however, less extensive than that of *Stomoxys* and Tabanids, and in nature it is specially connected with the transmission of "ghindi," i.e., *T. congolense* in bovines and *T. brucei* in equines.

KRAMER (H.). **Zur Gattung *Calliphora* R.D.**—*Konowia*, vii, no. 1, pp. 62–64, 4 figs. Vienna, 20th March 1928.

It is stated that *Calliphora erythrocephala*, Mg., is always closely associated with man and is distinct from the fly found on flowers in

forests in Germany, which is here described as *C. pseuderythrocephala*, sp. n. A key to the genus *Calliphora*, based on Stein's work, is given, though the author does not consider that the genus *Onesia* is distinct from it.

SCHWAR (H.). **Ueber die beiden Dasselfliegen des Rindes** (*Hypoderma bovis*, Latr., und *Hypoderma lineata* Brauer). [On the two Warble-flies of Cattle.]—*Badische Bl. Schädlingsbekämpfung*, i, no. 3-4, pp. 38-49. Freiburg i. Br., December 1924. *Badische Bl. angew. Ent.*, ii, no. 5, pp. 275-278, 9 refs. Freiburg i. Br., March 1928.

The first part of this paper contains an account of the history, distribution and classification of *Hypoderma bovis*, DeG., and *H. lineata*, Vill., and the second a survey of existing knowledge of the biology of these flies.

MERCIER (L.). **Présence de la mouche du ver chevelu des laines australiennes** (*Chrysomyia albiceps* Wied.) sur la côte du Calvados. **Une hypothèse de travail en vue de sa destruction.**—*Ann. Paras. hum. comp.*, vi, no. 2, pp. 200-202, 7 refs. Paris, 1st April 1928.

The occurrence of *Chrysomyia albiceps*, Wied., in Calvados (Normandy) is recorded [*R.A.E.*, B, xvi, 3].

The author suggests that it might be possible to control *C. albiceps* by means of parasitic Staphylinids of the genus *Aleochara*, the larvae of which attack the puparia of various Diptera, particularly *A. curtula*, Goeze, which is a parasite of *Lucilia caesar*, L., *Pegomyia hyoscyami*, Panz., and probably *Sarcophaga* spp. It may be assumed that it will also attack *C. albiceps*, which occurs in the same habitats as *L. caesar* and is more closely related to it than are *P. hyoscyami* or *Sarcophaga*. Species of *Aleochara* are usually abundant where they occur and are fairly easy to obtain. It is suggested that *A. curtula* should be reared in large numbers and liberated where wool is stored, when the larvae of *C. albiceps* are beginning to pupate, the process being repeated for several years.

LARROUSE (F.). **Présence du *Phlebotomus ingrami* Newst., à Entebbé (Uganda).**—*Ann. Paras. hum. comp.*, vi, no. 2, pp. 203-205, 2 figs., 9 refs. Paris, 1st April 1928.

The author briefly reviews the previous scanty data on *Phlebotomus* spp. in tropical Africa and records the occurrence of *P. ingrami*, Newst., at Entebbe, Uganda. This species has previously been recorded only from Ashanti [*R.A.E.*, B, iii, 11] and the Gold Coast.

GALLIARD (H.). **Contribution à l'étude des Culicidés d'Espagne.**—*Ann. Paras. hum. comp.*, vi, no. 2, pp. 206-210, 2 figs. Paris, 1st April 1928.

Notes are given on the breeding-places of mosquitos found in the provinces of Cáceres and Ciudad Real, in central Spain, in August 1927. The only species of *Anopheles* were *A. hispaniola*, Theo., which occurred only among green algae in running water, and *A. maculipennis*, Mg., which was not found among green algae. The commonest mosquito

was *Culex theileri*, Theo., which was found in association with each of the Anophelines and in a large variety of breeding-places; both alone and associated with *A. maculipennis* it was found breeding in ponds entirely covered with *Lemna*. The larvae of *C. theileri* were controlled by *Gambusia* almost as completely as were those of *A. maculipennis*.

RODENWALDT (E.). Guide for Government Officials, Estate Managers, etc., in treating Malaria Problems.—*Meded. Dienst Volksgezondheid Ned.-Ind.*, Foreign edn., xvii, no. 1, pp. 63-79. Batavia, 1928.

This is a discussion of the precautions against malaria that should be taken in establishing settlements in the Dutch East Indies. The mouths of rivers, often selected for commercial reasons, are dangerous unless they are large estuaries where all canals, drains, etc., are swept by the tide, or unless high ground extends on either bank. Low deltas with stagnant water are very suitable for rice-growing, but are favourable breeding-places for Anophelines. In rivers that have a bar across the mouth, the tidal lagoons become stagnant pools where *Anopheles ludlowi*, Theo., breeds freely. Fish-ponds may be harmless in a mountain district and very dangerous in a coastal zone of brackish water. On the north coast of Java they cause severe endemic malaria, as *A. ludlowi* breeds in them. Running water, even at altitudes above 3,000 ft., allows the breeding of such malaria vectors as *A. aconitus*, Dön., and *A. maculatus*, Theo., as well as of *A. aitkeni*, James, the importance of which is uncertain. In the eastern part of the Archipelago some species, such as *A. punctulatus*, Theo., breed in both running and stagnant water. Care must therefore be taken not to establish settlements nearer to water than about 550 yards, which is the flight range of the species concerned.

It is now known that the old practice of clearing the ground around a dwelling is dangerous, especially in the Dutch East Indies where the most important Anophelines breed in sunlit water, though some species, which are also strongly suspected of being vectors of malaria, such as *A. leucosphyrus*, Dön., and *A. aitkeni*, prefer shaded breeding-places. The clearing of virgin forest in the brackish water coastal zone will enable *A. ludlowi* to establish itself. In those rubber plantations where *A. maculatus* breeds in ravines as a result of the clearance of virgin forest, all habitations must be at a distance from such breeding-places. Tidal forests in their natural state have been proved to be much less dangerous than was formerly supposed, as no Anopheline larva can withstand the movement of the tide. Interference with these forests has resulted in epidemics of malaria. The felling and reclamation of tidal forests within about two miles of a settlement should be prohibited.

HOFFMANN (W. H.). Ueber das Vorkommen der Gelbfiebermücke in Niederländisch Indien. [On the Occurrence of the Yellow Fever Mosquito in the Dutch East Indies.]

BRUG (S. L.). Remarks on the previous Paper by Prof. Dr. W. H. Hoffmann.—*Meded. Dienst Volksgezondheid Ned.-Ind.*, Foreign edn., xvii, no. 1, pp. 182-185. Batavia, 1928.

The first of these papers records the successful crossing in Cuba of examples of *Aedes argenteus* (*aegypti*) from Cuba and the Dutch

East Indies [cf. *R.A.E.*, B, xvi, 48]. In the second, Dr. Brug records similar results from Java and concludes that the freedom of Asia from yellow fever cannot be ascribed to the existence of a special Asiatic form of *A. argenteus* [cf. B, xvi, 4]. No constant difference could be detected in the adults from the two regions.

DYAR (H. G.). **The Mosquitoes of the Americas.**—*Pub. Carnegie Instn.*, no. 387, v+616 pp., 123 pls. Washington, D.C., May 1928.

This volume, which treats of the mosquitos of the whole American Continent and the West Indies, forms a supplement to "The Mosquitoes of North and Central America and the West Indies," by Howard, Dyar and Knab, published by the Carnegie Institution of Washington, 1912-17. Many additional species and much new synonymy are included, but the classification is mainly that employed in the earlier work, except that the author now recognises five tribes in the subfamily CULICINAE, one of these being the Anophelini. Keys are given to the tribes, genera and species, for larvae and adults, two keys to the adults of each genus being included, one based on external characters and the other on the male hypopygia. Both sexes of the adult and the larva, where known, of each species are described, the descriptions being somewhat condensed, and the distribution and breeding-places are indicated. Bibliographical references under each species, given in the earlier work, apart from those to original descriptions, are not repeated, but subsequent ones of importance are added.

Twenty-seven new species are described, the descriptions in some cases being contributed by other workers, including *Anopheles* (*Chagasia*) *bathanus*, from Panama, where the larvae occur in large numbers along the edges of swiftly running streams, and Costa Rica, and *A. (Nyssorhynchus) guarani*, Shannon, from southern Brazil described from a single female taken in a house.

McCOMBIE YOUNG (T. C.) & BAILY (J. D.). **Malaria in Coorg.**—*Ind. J. Med. Res.*, xv, no. 3, pp. 745-795, 1 pl., 2 maps, 13 figs., 25 refs. Calcutta, January 1928.

Malaria is endemic and very prevalent in the Province of Coorg, which lies in the Western Ghats. In children from 1 to 10 years old the splenic index was 63.3 per cent., while 37.7 per cent. of them showed malarial parasites in the blood, more than half the infections being due to *Plasmodium falciparum* and the remainder to *P. vivax* and *P. malariae* in about equal proportions.

Accounts are given of Anopheline and malaria surveys made in various places in the Province. At Mercara, which stands nearly 4,000 feet above sea level and has an annual rainfall of 120-130 in. and average mean minimum and maximum temperatures ranging from 56.7 to 64.2° F. and from 69 to 85.8° F., Anopheline breeding-places were investigated just before the breaking of the monsoon at the beginning of June; the malarial incidence reaches its height in the spring and drops some weeks after the onset of the monsoon. In springs and streams in the seepage areas at the heads of the valleys that run through the town, *Anopheles maculipalpis*, Giles, was the commonest species, but in the inhabited area *A. listoni*, List., which was found in large numbers in stone-pitched open surface drains that

had been laid to drain seepage areas or carry off household drainage, was the commonest, *A. maculipalpis* being almost entirely absent. Other Anophelines collected were *A. minimus*, Theo., *A. maculatus*, Theo., *A. culicifacies*, Giles, *A. vagus*, Dön., *A. hyrcanus* var. *nigerrimus*, Giles, *A. karwari*, James, *A. jeyporiensis*, James, and *A. philippinensis*, Ludl. No Anopheline larvae were found in tree-holes, wells or rice-fields, and very few in the marshy land in the valleys. It appears that the policy that has been followed at Mercara of draining swamps by open drains is mistaken, and that in abolishing a wet area that was, perhaps, doing little harm, suitable breeding-places for *A. listoni*, a more efficient malaria carrier than the species that occur in swamps and natural water courses, have been multiplied. This may account for the increase of malaria in the town. Very few adult Anophelines were found in houses during the day, and it seems probable that the prolific vegetation around the houses provides more favourable resting-places. Anophelines found breeding in other localities in Coorg that were not found at Mercara were *A. aitkeni*, James, and *A. tessellatus*, Theo., in streams, *A. jamesi*, Theo., in uncultivated paddy land, and *A. subpictus*, Grassi, in overflow water from a tank. Adults of *A. fuliginosus*, Giles, were caught in a cow shed.

Throughout Coorg the sandfly, *Phlebotomus argentipes*, Ann. & Brun., was found in suitable cow-sheds and sometimes in houses, in some cases in large numbers. The temperature and humidity of Mercara, which is climatically typical of the greater part of the Province, conform with the conditions necessary for the transmission of kala-azar [cf. *R.A.E.*, B, xiv, 141], and the country is not unlike parts of Assam in which kala-azar is prevalent, but the only recent cases of the disease recorded in Coorg are believed to have originated elsewhere.

SHORTT (H. E.) & SWAMINATH (C. S.). **The Method of Feeding of *Phlebotomus argentipes* with Relation to its Bearing on the Transmission of Kala-Azar.**—*Ind. J. Med. Res.*, xv, no. 3, pp. 827–836, 4 pls., 3 refs. Calcutta, January 1928.

This paper describes two studies of the feeding of *Phlebotomus argentipes*, Ann. & Brun., in glass tubes on laboratory animals, comprising observations of the living fly in the act of feeding and studies of microscopical sections of the fly fixed *in situ* in the act of feeding with its proboscis embedded in the skin. The bearing of these studies on the possible transmission of kala-azar by the bite of *P. argentipes* is discussed, and it is concluded that if the disease is so transmitted, the infective material is likely to be in the form of a solid plug of flagellates introduced into the wound by an active expulsive effort on the part of the sandfly preliminary to the taking of a blood meal.

PATTON (W. S.) & HINDLE (E.). **The North Chinese Species of the Genus *Phlebotomus* (Diptera, Psychodidae).**—*Proc. Roy. Soc.*, Ser. B, cii, no. B.720, pp. 533–551, 11 figs., 7 refs. London, 2nd April 1928.

The characters of the eggs, first and fourth larval instars, pupae and adults of the three species of *Phlebotomus* found in North China [*R.A.E.*, B, xv, 41] are discussed and compared, and *P. taiwanensis*, sp. n., is described. This species was previously considered [*loc. cit.*] to be a

variety of *P. perturbans*, de Meij. (described from Java), but a comparison of preparations of the male genitalia and female pharynx of the two species has shown that they are distinct.

Phlebotomus major chinensis, Newst., begins to appear at the end of May in Shantung, the numbers increasing until the middle of June; towards the end of June, the numbers fall rapidly, and after the middle of July only occasional specimens are seen. Further north, in Chihli Province, the season is about two weeks later. No difficulty was experienced in inducing the females to oviposit or in rearing the sandflies in the laboratory. At room temperature (25-30° C. [77-86° F.]) the eggs hatched in 10-11 days, and most of the larvae completed their development in 25-30 days, while the pupal stage lasted 7-10 days; some of the larvae, however, from eggs laid by the same females, and kept under apparently identical conditions, did not pupate until the following February, and all those that had not pupated by the middle of August remained in the larval stage through the winter. The hibernating larvae, which were mostly in the fourth instar, were kept at a temperature of 16-24° C. [60-8-74-2° F.] and were found to be active whenever examined; the fact that they began to pupate in February and to produce adults in the latter part of March may be attributed to warmth. Larvae exposed to a temperature of -11° C. [12-2° F.] for a night were all killed, but others survived a night at 0° C. [32° F.], while larvae placed in an ice-chest all remained alive for 14 days and some for a month. The ground did not freeze below a depth of 10 ins. at Tsinan during the winter of 1926-27, which was considered a very cold season. The authors are convinced that under natural conditions the life-cycle of *P. major chinensis* is rarely completed in one season, the development of the larvae probably being much slower, owing to scarcity of food, than under laboratory conditions, in which there is always an abundant food supply. The flies that appear at the end of May and early in June probably come from larvae that reached the fourth instar before the winter, and those that appear later in June from larvae that only reached the third instar in the previous year; the isolated flies that are seen in August and September may represent a second brood that has developed under exceptionally favourable conditions. The males begin to appear before the females and greatly outnumber them for the first week or two, although later the proportions of the sexes are about equal. The adults are much more active than those of the other two species. As a general rule, the female seems to take only one feed of blood, and digestion proceeds comparatively slowly, traces of the meal still being present after 6 or 7 days; some were induced to feed a second time, but these only formed a small percentage of the total. The female lays one batch of about 50 eggs, 6-7 days after feeding, and then dies. The average length of life of the males is slightly shorter.

A variety of *Phlebotomus sergenti*, Parrot, is on the whole the commonest sandfly of North China, and it occurs in large numbers in many localities. It seems to have at least two broods a year, for although the adults first appear about the end of May, simultaneously with those of *chinensis*, there is not much diminution in their numbers until well on in August, and occasional specimens can be obtained throughout September. The larva is very sluggish and seems unable to become adapted to changes in environment, easily succumbing under adverse conditions, such as excessive moisture or dryness. The duration of the developmental stages is approximately the same as

for *chinensis*. Eggs laid in June give rise to adults 7-8 weeks later, the large numbers occurring in August presumably belonging to this second brood. The adults will readily feed three, four and occasionally even five times, before oviposition. As a rule the digestion of blood is very rapid, all traces of it having disappeared on the third day after a full meal, although traces may occasionally remain as long as five days. On five occasions males of *sergenti* were observed mating with females of *chinensis*.

Phlebotomus taianensis is somewhat local, but seems to have a wider distribution than *sergenti* or *chinensis*, as it is not dependent on man for its food supply. In the laboratory the duration of the life-cycle is similar to that of the other two species, and like *sergenti*, it seems to have at least two broods a year. The larva is much more hardy and active than those of *sergenti* and *chinensis* and can withstand desiccation for a considerable period. Pupal cases were found in loose earth, attached to small pieces of tile, at a depth of 6-8 inches. The adults seem to feed normally on batrachian and reptilian blood and readily attack frogs, toads, lizards and snakes. A few individuals were fed on a fowl and on a hamster [*Cricetulus*], so that it is possible that they may sometimes feed on man, although the authors were unable to induce them to do so. The process of digestion is even more rapid than in *sergenti*, and it is possible to induce the flies to feed every day or two.

The authors have been unable to obtain any evidence of the existence of *Phlebotomus* from the Yangtze River Valley southwards, and the present distribution agrees with what is known of the incidence of kala-azar in China, the disease being apparently restricted to the Provinces north of the Yangtze.

DE BEAUREPAIRE ARAGÃO (H.). **Leishmaniose tegumentar e sua transmissão pelos phlebotomos.** [Tegumentary Leishmaniasis and its Transmission by *Phlebotomus*.]—*Mem. Inst. Oswaldo Cruz*, xx, no. 2, pp. 177-195, 1 pl. Rio de Janeiro, 1927. (In Portuguese and English.)

This paper gives a briefer review than one already noticed [*R.A.E.*, B, xvi, 85] of investigations throughout the world on the transmission of leishmaniasis, but deals in greater detail with an outbreak caused by *Leishmania brasiliensis* and associated with *Phlebotomus intermedius*, Lutz & Neiva, in Rio de Janeiro, and with the author's experimental transmission of the disease by inoculating a dog with a suspension of these sandflies [x, 159].

RAYNAL (J.). **Enquête sanitaire à la Grande Comore en 1925. Observation de paludisme à forme épidémique.**—*Bull. Soc. Path. exot.*, xxi, nos. 1 & 2, pp. 35-54 & 132-141, 4 figs. Paris, 1928.

An account is given of an outbreak of malaria in the Grand Comoro, together with notes on the topography and sociology of the island, as a result of an investigation made in 1925. Until the last few years indigenous malaria was unknown and Anophelines were rare owing to the scarcity of water, the soil being so porous that there are no pools or streams, except immediately after rain, and only a few marshes, in which the water is brackish. The prosperity of the island, due to the high price of vanilla, the cultivation of which is carried out to the

exclusion of almost all other crops, resulted in an influx of population from the neighbouring islands where malaria is endemic, and also in the construction of a large number of cisterns. Many of these have been abandoned, and in them *Anophelines*, which may have been introduced in native sailing vessels from the neighbouring island of Mohilla, breed in large numbers. The author also found *Anophelines* breeding in the spathes of coconut palms. It is presumed that the combination of these factors was responsible for the outbreak of malaria in the island that began towards the end of 1923 and assumed serious proportions in 1924 and the first half of 1925, the spread of the disease being favoured by the susceptibility of the population.

The control measures suggested include the compulsory destruction or repair of disused cisterns and the oiling at least every week of those that are in use with coconut oil. Oiling of wells from which brackish water is obtained along the coast and of the marshes should also be carried out.

PINTO (C.). *Xenopsylla cheopis* (Roth.) hôte intermédiaire probable de *Gongylonema neoplasticum* (Fibiger et Ditlevsen) ou de *Protophysura muris* (Gmelin).—*Bull. Soc. Path. exot.*, xxi, no. 2, pp. 104-106, 1 fig., 4 refs. Paris, 1928.

A collection of 700 fleas from rats in Rio de Janeiro contained 394 specimens of *Xenopsylla cheopis* Roths., 296 of *X. brasiliensis*, Bak., 3 of *Leptopsylla segnis*, Schönh. (*musculi*, Dug.), 2 each of *Synosternus pallidus*, Täsch., *Ceratophyllus fasciatus*, Bosc, and *Ctenocephalus felis*, Bch., and 1 of *Pulex irritans*, L. Encysted larvae of a Nematode, probably either *Gongylonema neoplasticum* or *Protophysura muris*, both of which are very common in rats in Rio de Janeiro, were found in the abdominal region of 6 females and 5 males of *X. cheopis*. It is probable that the eggs of the Nematode are ingested with the excreta of rats by the larvae of the flea and that development takes place in the larvae and adults, the Nematode larvae reaching the infecting stage in the adult fleas and remaining there until the latter are swallowed by rats.

ROUBAUD (E.). Longue durée de l'asthénobiose pseudo-hivernale chez *Phlebotomus papatasi*: action réactivante de l'athermobiose prolongée.—*Bull. Soc. Path. exot.*, xxi, no. 2, pp. 107-108, 1 ref. Paris, 1928.

Further investigations on the diapause in the fourth instar in larvae of *Phlebotomus papatasi*, Scop. [*R.A.E.*, B, xvi, 56] have shown that a rise in temperature is not essential for the reactivation of inactive larvae kept at a low temperature, but that the duration of the diapause under such conditions is very long. Larvae reared at 28° C. [82.4° F., and then, after entering the diapause, kept in fairly dry soil but in a moist atmosphere at room temperature (14-22° C. [57.2-71.6° F.) resumed activity, pupated and produced adults after intervals of 7-10 months, 9-12 months after the eggs were laid from which they hatched.

The fact that inactive larvae do not need a very moist medium provided that the atmosphere is moist suggests that the larvae can remain inactive for a long period in cracks in walls and in the ground where the moisture content of the air is high, and the delays in larval

development explain the sudden appearances of the flies in certain places at very variable intervals, which have been observed to occur with this species.

SWELLENGREBEL (N. H.) & DE ROOK [H.]. **Effet comparé de quelques larvicides.**—*Bull. Soc. Path. exot.*, xxi, no. 2, pp. 109–112, 1 fig. Paris, 1928.

The authors give the results of further tests made in Holland of the comparative efficiency as mosquito larvicides of Paris green, kerosene and an almost colourless oil that they call liquid vaseline (paraffin), having sp. gr. 0.875–0.880 (at 15° C. [59° F.]), viscosity 4.8 Engler (at 20° C. [68° F.]), igniting at 150–155° C. [302–311° F.] and costing about £1 per cwt. It has been suggested that the quantities of liquid vaseline used previously [*R.A.E.*, B, xv, 102], being much smaller than the quantities of kerosene necessary to kill mosquito larvae, are inadequate. Three series of experiments were carried out, each series in one canal, in which the conditions were the same throughout. In each series the sections treated with 5 or 6 cc. of liquid vaseline to the square metre contained no larvae after 6 or 8 days and only a very few after 4 or 5 days, while four times this quantity of kerosene was needed to produce the same result, 18 per cent. of the larvae surviving after 10 days with 10 cc. kerosene to the square metre. During the first and second days kerosene appears to be more efficient than liquid vaseline, but it evaporates before all the larvae are killed, especially when there is, as in these experiments, an abundance of aquatic vegetation; liquid vaseline does not evaporate. The results with Paris green, 1 part to 100 parts fine ashes, at the rate of 20, 25 or 40 cc. to the square metre, confirmed those previously obtained; the effect was prompt but of short duration, no larvae being found after one or two days but a considerable number after three or four.

In one experiment another petroleum derivative, an amber-coloured, fluorescent oil having sp. gr. 0.856 and igniting at 87–97° C. [188.6–206.6° F.], was used; at the rate of 15 cc. to the square metre this destroyed all larvae in one day, and none had reappeared in six days.

A further series of experiments was carried out to compare the toxicity of Stoxal [the proprietary larvicide previously noticed, of which the active principle is formaldehyde, *R.A.E.*, B, xiv, 121; xv, 103] with that of Paris green, the observations in this case only extending over a period of 24 hours. Complete control was obtained with 0.2 gm. Paris green and 20 cc. ashes to the square metre, and almost complete control with half these quantities, but 83–96 per cent. of the larvae survived when Stoxal was used at the same rates, 72 per cent. when it was used at the rate of 2 gm. with 40 cc. fine sand to the square metre and 40 and 46 per cent. when it was used undiluted at the rate 10 and 15 gm., respectively. With reference to these results Roubaud pointed out that the dosage used was much too high, a few centigrammes of Stoxal to the square metre giving much better results, as large quantities of the material form a thick covering on the water that hinders the feeding of the larvae.

MATHIS (C.). **Transmission expérimentale au singe du spirochète de la museraigne, par le pou.**—*Bull. Soc. Path. exot.*, xxi, no. 2, pp. 173–177, 1 fig., 3 refs. Paris, 1928.

An experiment in which the author succeeded in transmitting *Spirochaeta crociduræ* from a monkey infected by direct inoculation

to a healthy monkey, by means of crushed lice [*Pediculus*], has already been noticed [R.A.E., B, xvi, 57]. The bites of the lice did not produce infection. Additional matter here given includes an account of a similar preliminary experiment, in which a positive result was also obtained, and a discussion of possible objections to the validity of the results. The presence of *S. crociduræ* in the monkeys into which the crushed lice were inoculated was only proved by inoculating their blood into mice, which developed infections; no spirochaetes were seen in the blood of the two monkeys, nor did they show any ill effects. The author considers that this explains the apparently negative results obtained by Nicolle and Anderson with lice [R.A.E., B, xvi, 18]. In connection with the mode of transmission of *S. crociduræ* from the shrew [*Crocidura*], the author states that the only ticks that he has found in the burrows of the shrew are larvae of *Rhipicephalus*, with which he has not experimented.

[SHINGAREV (N. I.).] Шингарев (Н. И.). **Notes on Culicidae. II.** [In Russian.] — *Russ. J. Trop. Med.*, v, no. 9, pp. 545-550, 5 figs. Moscow, 1927. (With a Summary in English, pp. 603-604.)

Six new Culicines are here described, and four are recorded for the first time from various parts of European and Asiatic Russia.

[SIMANIN (P. I.).] Симанин (П. И.). **On the Biology of *Anopheles maculipennis*, Mg., and *A. hyrcanus* var. *pseudopictus*, Grassi.** [In Russian.] — *Russ. J. Trop. Med.*, v, no. 9, pp. 569-574. Moscow, 1927. (With a Summary in French, pp. 605-606.)

A list is given of the mosquitos collected in various localities of the Altai Government, with notes on the seasonal history of the Anophelines observed, viz., *Anopheles maculipennis*, Mg., *A. hyrcanus*, Pall., and *A. hyrcanus* var. *pseudopictus*, Grassi. A table is given showing the number of feeds taken and the number of eggs laid by females of *A. hyrcanus*. It was found that *A. maculipennis*, if fed only on blood, will lay eggs during the winter. If the mosquito is given a sugar solution 1-2 days after the blood-meal, no eggs are laid until it again receives a blood-meal. Fifty mosquitos given a blood-meal and kept at 24-28°C. [75.2-80.6°F.] all laid eggs and died in 6-10 days. Twenty individuals, kept under similar conditions, but given sugar solution the day following the blood-meal, lived 15-25 days without laying any eggs. Upon dissection they were found to contain developed eggs.

[YATZENKO (F. I.).] Яценко (Ф. И.). **On the Ecology of *Anopheles bifurcatus*, L., in the Crimea.** [In Russian.] — *Russ. J. Trop. Med.*, v, no. 9, pp. 574-583, 3 refs. Moscow, 1927.

The topography and climate of the Crimea are discussed with reference to the distribution of *Anopheles bifurcatus*, L., which is considered by a local authority to be the chief vector of malaria in the mountain regions. This mosquito is gradually spreading towards the lowlands, as the destruction of the forests during the War has exposed the high plateau to the winds. The larvae are found in shaded still waters, as well as in small swiftly running mountain streams. A

biological analysis of the water showed them to occur mainly in those of an oligosaprobic nature and only occasionally in mesosaprobic waters [cf. *R.A.E.*, B, xv, 153]. The temperature of the water containing larvae was in no case above 20° C. [68° F.]. Other essentials for the development of *A. bifurcatus* in the Crimea are a sufficient amount of precipitation during the summer, a sufficient humidity of the atmosphere, and an insignificant daily fluctuation of temperature. In the districts under observation the daily variation in temperature did not exceed 2° C. throughout the spring, summer and autumn. The flora is important in the life of *A. bifurcatus*, indirectly by protecting and shading temporary waters, such as those resulting from the melting of snow, and directly by supplying the pollen that is the usual food of the males and on which the females sometimes feed.

In the Crimea *A. bifurcatus* hibernates mainly as a larva, though a small number of adults may survive to the following spring.

Remedial measures should in the first place include re-afforestation and conservation of pasture lands. This is essential for general economic reasons and to prevent the excessive spring floods that now occur owing to the sudden melting of the snow on the unsheltered high plateau. These floods spread far beyond the normal river banks, and when the water subsides, they leave numbers of shallow pools suitable for mosquito breeding. Owing to the difficulty of transporting liquid larvicides, such as kerosene, Paris green should be used for the destruction of the larvae. In limited experiments the larvae of *A. bifurcatus* and *A. maculipennis*, Mg., readily swallowed the particles of Paris green mixed with powdered clay at the rate of 1 : 40, and all were dead on the following day.

MARTINI (E.). **Ueber Wolgamücken und Wolgamalaria.** [Volga Mosquitos and Volga Malaria.]—*Verh. Int. Ver. theoret. angew. Limnologie*, iii, pp. 282–290. *Sine loco*, ? 1927.

In the Saratov district the river Volga rises in spring, reaching by the end of May a level 36–45 ft. above the autumn level. The species of *Anopheles* found along the river were *A. bifurcatus*, L., and *A. maculipennis*, Mg., but only the latter is of importance as regards malaria. It differs from *A. maculipennis* in Germany and resembles in some characters *A. sacharovi*, Favr (*elutus*, Edw.). As in Germany, *A. maculipennis* on the middle Volga breeds in sunny, clean water with horizontal or short vegetation such as meadow grasses, while *A. bifurcatus* prefers vertical vegetation and shade. In Saratov, however, *A. maculipennis* was sometimes found in semi-shaded places below willow bushes. Possibly the higher temperature of the water as compared with Germany renders it less dependent on sunshine. Sunlit water abounds in the river bed, which is constantly altering its contours and provides stretches of breeding-places many miles in length. When the river is at its height, the meadow grasses are entirely submerged, but patches of algae swarm with the larvae, which, as the water recedes later on, are found among the grasses and weeds. By the end of July the water has fallen to its low level, and then the true water-plants and algae afford extensive breeding-places until the autumn. The increase of malaria in years of drought is due to the fact that the peasants from distant villages then have to pasture their cattle in the

river meadows. Anti-mosquito work can scarcely be done until the river has been regulated, and this is not feasible under present economic conditions.

MARTINI (E.). **Einiges über die Malariaverhältnisse in Anatolien.**

[Some Notes on Malaria Conditions in Anatolia.]—*Abh. Ausldsk. Hamburg. Univ.*, xxvi (D.Med. ii), pp. 308-313. [Hamburg, ? 1927.]

Malaria is rife in the interior of Anatolia, especially in the lowlands on the coast. In the plateau region the climate is colder and drier, and the disease is less intense. A list is given of the mosquitos hitherto found, including the following Anophelines: *Anopheles algeriensis*, Theo., *A. bifurcatus*, L., *A. plumbeus*, Steph. (*nigripes*, Staeg.), *A. sacharovi*, Favr (*clutus*, Edw.), *A. maculipennis*, Mg., *A. hyrcanus* var. *sinensis*, Wied., and *A. superpictus*, Grassi. Van Thiel has attached importance to colour variation in *A. maculipennis* in Holland as indicating various races of different importance as regards malaria (*R.A.E.*, B, xv, 181), but it seems doubtful whether these variations are racial, for in Anatolia considerable differences occur not only in *A. maculipennis*, but also in *A. algeriensis*, *A. sacharovi* and *A. bifurcatus*. *A. maculipennis*, *A. sacharovi*, and *A. superpictus* are the predominant species, and are probably vectors of malaria. *A. superpictus* is less abundant than the other two, but is more difficult to control. Of the non-domestic species very little is known of *A. algeriensis*. *A. hyrcanus* var. *sinensis* is probably more widespread than is believed, but its habits cause it to appear rare and render it unsuitable as a vector. It may possibly cause malaria among the rice-field workers camping near the fields in autumn. *A. bifurcatus* can do little harm in the hills owing to the scanty population, but may be of some importance in one district.

SOLLANI (G.). **La malaria nel Mantovano. Storio e stato attuale.**

[Malaria in the Region of Mantua. Its History and present Status.]—*Riv. Malariol.*, vii (N.S. iii) supplmt., 91 pp., 1 map. Rome, 1928.

An account is given of the history of malaria in and around Mantua and of investigations, made since 1900 by the author and others, regarding the epidemiology of the disease there. *Anopheles maculipennis*, Mg., is the only Anopheline found. Hibernating individuals occur in enormous numbers in the town in dark, draughtless places in houses, usually on the ceilings. In summer in the country animal quarters are always infested, but the dwellings of the poorest peasants are free, the mosquitos being rare in dwellings even in hamlets where animals are not stabled near the houses. It had been supposed that the rice-field areas were a particularly dangerous centre of malaria, but the regular administration of quinine has resulted in a notable decrease of the disease there, so that they do not now present a special problem. In other districts anti-mosquito measures, which need not be extensive or costly, must be directed against the larvae in the lakes and canals and against the hibernating adults.

MISSIROLI (A.). **Alcuni protozoi parassiti dell'*Anopheles maculipennis*.** [Some Protozoa parasitic in *A. maculipennis*.]—*Riv. Malariol.*, vii, no. 1, pp. 1-3, 1 pl., 4 refs. Rome, January-February 1928. (With Summaries in Italian, p. 76, French, p. 78, English, p. 80, German, p. 82.)

During dissection of *Anopheles maculipennis*, Mg., in Italy to ascertain whether the malarial parasites can hibernate as sporozoites in the various tissues, three protozoa were observed. One is a flagellate belonging to the genus *Crithidia*, the two others being Cnidosporidia. One of the latter belongs to the genus *Nosema*, and the other is here named *Sarcocystis anophelis*, sp. n. The occurrence of the last-named suggests the possibility that the Sarcosporidia of herbivorous animals may be transmitted by insects.

PAPERS NOTICED BY TITLE ONLY.

- HARDY (G. H.). **Notes on Australian and Exotic Sarcophagid Flies.**—*Proc. Linn. Soc. N.S.W.* 1927, lii, pt. 4, pp. 447-459, 11 figs., 7 refs. Sydney, December 1927.
- THORPE (W. H.). ***Culicoides nubeculosus* Meig. (Diptera, Ceratopogonidae) breeding in the Sea.**—*Ent. Mo. Mag.*, lxiii, p. 138. London, June 1927.
- EDWARDS (F. W.). **Notes on British *Simulium* (Diptera).**—*Ent. Mo. Mag.*, lxiii, pp. 255-257, 1 fig. London, November 1927.
- SINTON (J. A.). **Notes on some Indian Species of the Genus *Phlebotomus*. Part xxii. The Female of *P. newsteadi* Sinton 1927.**—*Ind. J. Med. Res.*, xv, no. 3, pp. 589-593, 1 pl., 3 refs. Calcutta, January 1928.
- BARRAUD (P. J.). **A Revision of the Culicine Mosquitoes of India. Part xxiii. The Genus *Aedes* (sens. lat.) and the Classification of the Subgenera. Descriptions of the Indian Species of *Aedes* (*Aëdimorphus*) [with one new species], *Aedes* (*Ochlerotatus*), and *Aedes* (*Banksinella*), with Notes on *Aedes* (*Stegomyia*) *variegatus*.**—*Ind. J. Med. Res.*, xv, no. 3, pp. 653-669, 4 pls., 10 refs. Calcutta, January 1928.
- BARRAUD (P. J.) & COVELL (G.). **The Morphology of the Buccal Cavity in Anopheline and Culicine Mosquitoes.**—*Ind. J. Med. Res.*, xv, no. 3, pp. 671-679, 8 pls., 1 ref. Calcutta, January 1928.
- SHUTE (P. G.). **A new Variety of *Culicella morsitans* (Theobald) [var. *litorea*, n.] (Diptera).**—*Entomologist*, lxi, no. 783, p. 186. London, August 1928.
- [WAGNER (Yu. N.). Вагнер (Ю. Н.). **Historical Review and Criticism of the Classification of Fleas (Aphaniptera).** [In Russian.]—*Ann. Mus. zool. Acad. Sci. U.R.S.S.*, xxviii, pt. 3, pp. 440-456, 5 refs. Leningrad, 1928.
- IOFF (I. G.). **Ueber neue Aphanipteren in der Sammlung des Zoologischen Museums der Akademie der Wissenschaften.** [New Siphonaptera in the Collection of the Zoological Museum of the Russian Academy of Science.]—*Ann. Mus. zool. Acad. Sci. U.R.S.S.*, xxviii, pt. 3, pp. 407-439, 20 figs., refs. Leningrad, 1928.
- CHORINE (V.). **Sur l'immunisation des chenilles de *Galleria mellonella* contre le *Bacterium galleria* no. 2.**—*C.R. Acad. Sci. Fr.*, clxxxvi, no. 24, pp. 1659-1661, 6 refs. Paris, 1928.

SWELLENGREBEL (N. H.) & DE ROOK (H.). **Densité de la population et anophélisme.**—*Riv. Malariol.*, vii, no. 1, pp. 4-6, 1 ref. Rome, January-February 1928. (With Summaries in Italian, p. 76, French, p. 78, English, p. 80, German, p. 82.)

In a previous paper it was pointed out that with an increase in population a smaller number of mosquitos would attack any given man [*R.A.E.*, B, xiv, 23]. An example of this was provided during work against mosquito larvae on a piece of land in the north of Holland jutting out into the Zuider Zee and including an area of pasture land of about 1,000 acres. Counts were taken of the Anophelines in animal quarters, etc., in the town of Medemblik (the centre of the entire region where anti-larval work was done), in a group of three farms isolated in the centre of the pasture land, and in a village outside the protected region. The largest number of Anophelines occurred in the second group despite the absence of suitable breeding-places such as were numerous in the village. This is a matter of practical importance as regards the draining of the Zuider Zee, because even if breeding-places may be few, the dwellings will be scattered and at first will lack the protection afforded by animal quarters.

SWELLENGREBEL (N. H.) & DE ROOK (H.). **Signification du nombre relatif des mâles d'*Anopheles maculipennis*.**—*Riv. Malariol.*, vii, no. 1, pp. 7-10, 1 ref. Rome, January-February 1928. (With Summaries in Italian, p. 76, French, p. 78, English, p. 80, German, p. 82.)

In a previous paper the senior author concluded that in Holland the factor of a suitable shelter influences the proportion of males of *Anopheles maculipennis* [*R.A.E.*, B, xv, 102]. In observations at Medemblik males predominated in light and open sheds, and the factor of a suitable shelter did not seem always applicable. It is concluded that the proportion of males can be utilised as an indicator of the distance of the breeding-places provided that consideration be limited to adults captured in comparable conditions.

RAFFAELE (G.). **Una nuova specie di *Anopheles*.**—*Riv. Malariol.*, vii, no. 1, pp. 11-17, 6 figs. Rome, January-February 1928. (With Summaries in Italian, p. 77, French, p. 79, English, p. 81, German, p. 83.)

The egg, larva and both sexes of the adult of *Anopheles (Myzomyia) italicus*, sp. n., are described from Calabria, where the larvae occur in mountain torrents. Adults were observed in August and September only, and very few were noticed in dwellings or animal quarters.

LA FACE (L.). **Sulla resistenza delle larve degli anofelini alla salinità.** [The Resistance of Anopheline Larvae to Salinity.]—*Riv. Malariol.*, vii, no. 1, pp. 18-30, 16 refs. Rome, January-February 1928. (With Summaries in Italian, p. 77, French, p. 79, English, p. 81, German, p. 83.)

After a brief survey of some of the investigations that have been made on the effect of salinity on Anopheline larvae the author describes a series of laboratory experiments with *Anopheles maculipennis*, Mg., *A. sacharovi*, Fabr. (*clutus*, Edw.), and *A. superpictus*, Grassi. The eggs or the newly hatched larvae were placed in salt solutions of

initial concentrations of sodium chloride varying from 5.85 to 14.62 per mille and rising as the water evaporated. With initial concentrations of 5.85, 7.31 and 9.35 per mille, the larvae of *A. maculipennis*, *A. sacharovi* and *A. superpictus* adapted themselves rather uniformly to considerable increases, but with stronger initial concentrations, differences became apparent. The larvae of *A. sacharovi* develop completely (starting from 9.75 per mille) or nearly so (starting from 11.7–14.62 per mille), whereas at these concentrations the development of *A. maculipennis* quickly stopped, while the effect on *A. superpictus* was intermediate. In nature the effect of salts other than sodium chloride that may also be present in water will have to be considered.

In a communication to the author, Dr. Gul Hane, Director of the Anti-malarial Commission at Angora, states that near Angora *A. sacharovi* represents 85–96 per cent. of the Anophelines in waters of a high salinity.

HARNED (R. W.). **Entomology in the Southern States.**—*J. Econ. Ent.*, xxi, no. 1, pp. 59–86. Geneva, N.Y., February 1928.

This brief account of the development of entomology in the south-eastern States, in which the achievements in insect control in this region are discussed, includes short notes on the reduction of Anopheline mosquitos and malaria and the results of work on eradication of the cattle tick [*Boophilus annulatus*, Say].

MARCOVITCH (S.). **The Relative Toxicities of Arsenicals and Fluorine Compounds to various Organisms.**—*J. Econ. Ent.*, xxi, no. 1, pp. 108–114, 2 graphs, 9 refs. Geneva, N.Y., February 1928.

Studies to determine the relative toxicities of such inorganic compounds as fluorides and arsenicals showed that while sodium fluosilicate at .01 molar (1 : 532) produced 50 per cent. mortality in the larvae of *Culex fatigans*, Wied. (*quinquefasciatus*, Say) within 55 minutes, sodium arsenite at the same concentration required 135 minutes, sodium arsenate 390 minutes and sodium fluoride 420 minutes. With the

formula $K = \frac{1}{t} \log \frac{1}{\text{conc.}}$, where "t" represents the velocity of fatality

and K a constant expressing a numerical value of toxicity, the following values of K were obtained against *C. fatigans*: Sodium fluosilicate 32.1, sodium arsenite 9.6, sodium arsenate 3.5, and sodium fluoride 3. Sodium fluosilicate is thus ten times more toxic than sodium fluoride. In concentrations of 1 : 100 the fluorides of calcium, magnesium, strontium, copper, barium and lead produced 50 per cent. mortality in 84, 54, 55, 6, 3 and 1½ hours respectively. At the same concentration sodium fluosilicate required only 45 minutes. The insoluble arsenicals, calcium arsenate, lead arsenate and Paris green killed in 11, 4 and 1¾ hours respectively. If calcium arsenate is allowed to remain in water three days before testing, it becomes as toxic as lead arsenate.

APFELBECK (V.). **Recherches et observations sur les arthropodes pathogènes de l'homme et des animaux.**—*Edition Inspectorat Minist. Santé publ. Sarajevo*, no. 17, 48 pp., 25 figs., 10 refs. Sarajevo, 1925.

The observations recorded in this paper were made in various parts of Bosnia, Herzegovina and Dalmatia. The first part contains notes on the biology of *Anopheles maculipennis*, Mg., *A. bifurcatus*, L., *A.*

superpictus, Grassi, and *Aedes argenteus*, Poir. (*Stegomyia fasciata*, F.), and the second part observations on the ecology and control of the Anophelines.

Anopheles maculipennis is the commonest Anopheline in Bosnia and Herzegovina and the principal vector of malaria. It breeds in backwaters and along the marshy banks of rivers, in floating vegetation of even the larger ones, in the slow-flowing parts of mountain streams, and in lakes, stagnant water, ditches, water-butts, etc., throughout the two Provinces up to an altitude of over 3,000 ft. The first larvae appear in April in Bosnia. This mosquito is abundant in certain marshy areas that are not frequented by man or domestic animals, and where it must attack wild animals; further, in one village considerable numbers of engorged mosquitos occurred in the animal quarters, but the inhabitants were not bitten and there was no malaria, while in the neighbouring villages, where the cattle were not brought in at night, malaria occurred. In Herzegovina very few adults apparently hibernate in dwellings, possibly because they are too smoky on account of open hearths, or in animal quarters constructed after the local manner, of stones without mortar; it seems probable that they mostly hibernate in caves. The author suggests that a measure of protection from the bites of *A. maculipennis* in summer and autumn may be obtained by opening windows an hour before dusk, closing them after nightfall and not opening them again until an hour after daybreak, as the mosquitos leave their day resting places at sunset and return at sunrise.

Anopheles bifurcatus is less widely distributed than *A. maculipennis* and is of little importance in relation to malaria. The adults do not enter houses, and in the districts where they are most abundant indigenous malaria does not occur. Living larvae were found in a marsh under a thin layer of ice in December and in mud at the bottom of a small stream, the water of which had frozen solid, in January, but they were killed when put in water that froze, showing that their survival depended on the fact that the mud did not freeze. On 3rd March larvae and pupae were obtained in a stream near Sarajevo fed partly by saline springs and having a rich fauna; from these, adults were obtained from 11th to 20th March. *A. bifurcatus* was also found breeding in company with Culicines in wells in southern Dalmatia, where the larvae were preyed upon by the water bug, *Velia currens*, F.

Anopheles superpictus largely replaces *A. maculipennis* as the commonest Anopheline in parts of southern Dalmatia, where it is probably an important vector of malignant tertian malaria. It hibernates in the adult stage and breeds in mountain streams. Between 30th May and 5th June the author found the adults in houses and the larvae and pupae in pools containing *Spirogyra* in a stream bed; on 28th August young larvae predominated in the same breeding-places. Hibernating adults were found in cellars in November. The author does not agree with Karaman, who considered that *A. superpictus* was negligible as a vector of malaria in Macedonia on account of its late appearance (R.A.E., B, xii, 192), and quotes Martini and Konsuloff, who considered it to be of great importance in Macedonia and Bulgaria (B, xii, 148; ix, 177), and Doflein, who recorded three generations in Macedonia, the adults being active in May, August-September and October and more numerous than those of *A. maculipennis*. Further investigations on the exact time of appearance of *A. superpictus* in Macedonia would, however, be of interest.

Aedes argenteus has been found in several localities in southern Dalmatia. The females were on the wing both during the day and at night, but appeared to bite chiefly at sunset and towards sunrise. Hibernation apparently takes place in the adult stage, as adults were still common in October, but no larvae or pupae could be found.

In some of the rivers of Bosnia and Herzegovina *Anopheles maculipennis* breeds very freely in summer and autumn in the extensive masses of *Ranunculus* (*Batrachium*) *paucistamineus* and, after they have become covered with algae, as is always the case when the water is low, in masses of other water plants. The water-lilies, which cover considerable stretches of water along the banks, provide a habitat for the larvae where they are protected from fish and from insects that swim on the surface of the water. The only method of destroying the larvae in water plants is to remove the plants in nets and bury them. This measure is particularly valuable in the autumn, in the first place because at that time the rivers are the only breeding-places and in the second because of the importance of diminishing the numbers of mosquitos before hibernation. Breeding-places created by the activities of man, such as the construction of roads, irrigation, etc., are discussed.

A list of water plants with which mosquito larvae are commonly associated is given. The presence of *Lemna* on ponds does not prevent the breeding of Anophelines unless the plant completely covers the surface of the water. The author has found Anophelines breeding in water containing *Chara* on many occasions; in one instance there were large numbers of larvae of *A. maculipennis* in a pool that contained no vegetation other than *Chara* and some *Spirogyra*; the development of young larvae was not hindered by placing them in breeding jars containing *Chara*. Considerable numbers of Anopheline larvae also occurred in a large pond containing a quantity of *Utricularia vulgaris*.

Of the predacious insect enemies of Anopheline larvae the most important appear to be water bugs of the genera *Hydrometra* and *Velia* and beetles of the genus *Gyrinus*, as these insects keep to the surface of the water. Bugs of the genera *Corixa* and *Notonecta*, particularly *C. (Macrocorixa) geoffroyi*, Leach, undoubtedly destroy many Culicine larvae. The author considers that the most important natural enemies of larvae of *Anopheles*, particularly *A. bifurcatus*, are the Crustacea, *Gammarus pulex*, L., and *Carinogammarus rosceli*, Gerv., and that the relative scarcity of *A. bifurcatus* may be accounted for by the fact that it breeds in streams where these are abundant. The author has not observed cannibalism among Anopheline larvae, and doubts whether it occurs.

STOKES (A.), BAUER (J. H.) & HUDSON (N. P.). **Experimental Transmission of Yellow Fever to Laboratory Animals.**—*Amer. J. Trop. Med.*, viii, no. 2, pp. 103–164, 28 figs., 4 refs. Baltimore, Md., March 1928.

Following the successful transmission of yellow fever to an Indian monkey (*Macacus rhesus*) by intraperitoneal inoculation of infected human blood, it was found that the disease was readily transmissible from one monkey of this species to another either by inoculation of blood or by the bite of the mosquito, *Aedes argenteus*, Poir. (*aegypti*, L.). It was found more convenient to preserve the virus in the mosquito than by frequent blood inoculations of monkeys, and a series of transmission experiments was carried out at Lagos. As mosquitos.

confined in test-tubes refused to bite monkeys, cages were constructed in which they could be kept, and into which monkeys could be introduced. The technique employed, the method of breeding the mosquitos and the construction of the cages and of the portable mosquito-proof room in which all work with mosquitos was done, are described.

Twenty-six transmission experiments with *A. argenteus* were carried out, and in 24 cases a fatal infection resulted; one monkey developed fever but recovered, and one remained refractory. The average incubation period was 3-4 days. The shortest time after feeding on an infected monkey that mosquitos were fed on a healthy one was 16 days; in one experiment a fatal infection was transmitted after this interval; in another a monkey was exposed to the bites of 64 mosquitos that had had an infective feed 16 days previously, and remained well, but died as the result of exposure to the same mosquitos 5 days later. One mosquito produced fatal infections when allowed to bite monkeys 85 and 91 days after its infective feed, and died 15 days later; another produced an infection from which the monkey recovered, 101 days after its infective feed, and 12 days before its death. No mosquitos lived longer than these. Only two lots of *A. argenteus* failed to become infective after being fed on infected monkeys during the second or third day of fever.

To test the possibility of hereditary infection in *A. argenteus*, over 200 adults, reared from eggs laid by mosquitos known to be infective, were allowed to feed on a susceptible monkey, 79 becoming fully engorged, but the monkey remained well.

Previous investigators have shown that the virus of yellow fever is easily filtrable when present in the circulating blood of man. In experiments, the virus in the blood of *M. rhesus* was filtrable through certain grades of filter, while the virus in a highly concentrated suspension of macerated infected mosquitos was not. It therefore seems probable that the virus has different morphology and dimensions when in the mosquito.

Inoculation of monkeys with serum from a convalescent patient who had had a severe attack of yellow fever, in amounts of 1, 0.5 and 0.1 cc., protected them completely from infection by inoculation or mosquitos. Normal human serum gave no protection. Anti-icteroides serum, prepared from a horse that had been immunised against a number of strains of *Leptospira icteroides* also failed to protect monkeys against infection by mosquitos or inoculation. No *Leptospira* or other micro-organism was found in tissues of infected monkeys, and attempts to cultivate the virus from infectious blood or from filtered emulsions of infected mosquitos failed.

A mite, *Pneumonyssus griffithi*, Newst., was found very frequently in the lungs of infected monkeys.

Indian crown monkeys (*Macacus sinicus*) proved only moderately susceptible to yellow fever, and other animals inoculated with infective human blood, including chimpanzees, local African monkeys and guineapigs, were totally refractory.

KLIGLER (I. J.). **Further Studies on the Epidemiology of Malaria in Palestine.**—*Amer. J. Trop. Med.*, viii, no. 2, pp. 183-198, 6 figs., 1 ref. Baltimore, Md., March 1928.

This paper is supplementary to one noticed previously [*R.A.E.*, B. xiv, 127] and summarises confirmatory and additional observations made in 1925. Records of the temperature of the water in Anopheline

breeding-places in several localities in Palestine for each month from March to December are tabulated. The temperature of the water and the indoor air temperature are more important in relation to mosquitos than the outdoor air temperature. Various factors affect the surface temperature of water, and spring waters often have a temperature quite distinct from that of stagnant water and one that is remarkably constant throughout the year. Indoor temperatures are more directly related to outdoor ones than are water temperatures, because of the lack of permanent heating arrangements. The outdoor winter temperatures are low enough to slacken adult activity and to stop larval development completely, while the indoor temperatures, although usually slightly higher than those of the outdoor air, are generally low enough to inhibit the activity of the adults, being in most cases below 16° C. [60·8° F.] in their hiding places. The sexual development of the malaria parasite may also be either retarded or completely prevented by cold. The author has found active sporozoites in *Anopheles sacharovi*, Favr (*elutus*, Edw.) in January, but not in February. The high summer temperatures also affect the activity of both larvae and adults of mosquitos. In August the maximum water temperatures of 34–36° C. [93·2–96·8° F.] are harmful to the larval development of *A. sacharovi*, and the adults seek shelter in stables in large numbers, a slackening taking place in their general activity and particularly in their egg-laying capacity. The concentration of adults of *A. sacharovi* in stables in August is followed by a sharp drop in the numbers of both larvae and adults in September and the first half of October. It is only from March to the middle of July and in October and November that the temperature is favourable to the activity and development of *A. sacharovi*.

The conclusions previously reached with regard to the relation between the quantity and distribution of winter rainfall and the prevalence of malaria in the following summer and autumn were borne out in 1925. The rainfall was below normal and was concentrated in the last part of December and January, during which period heavy rain fell. Consequently the springs were low, but the coastal marshes were very extensive, and malaria was relatively prevalent along the coast and uncommon inland. The difference in atmospheric humidity between the various regions of Palestine does not apparently affect malaria prevalence.

It is fairly certain that *Anopheles sacharovi* and *A. sergenti*, Theo., in the salivary glands of both of which active sporozoites have been found, and *A. superpictus*, Grassi, in which cysts have been found, are all carriers of malaria in Palestine. *A. sacharovi* has two periods of maximum prevalence, one in June, chiefly along the coast, and the other in November, chiefly inland. The difference is attributable to the facts that the breeding-places along the coast are much more extensive, but dry up wholly or in part towards the end of July or August, and that the climate is more temperate on the coast than along the Jordan. *A. superpictus* has two periods of prevalence, a minor one in July and a major one in September–October. *A. sergenti* is the distinctive late summer species, being most prevalent in September–October.

Observations have shown that the range of flight of Anophelines may extend to two miles or more and that epidemics of malaria may result from the invasion of an uninfected village by mosquitos from an infected one. In considering this problem three distinct phases of

flight must be taken into account; firstly, direct flight from breeding-places, which has been found in many instances to be at least $1\frac{1}{2}$ miles; secondly, dispersion during the active breeding season from a village $1\frac{1}{2}$ miles or less from a breeding-place to neighbouring villages much further away; and thirdly, dispersion just prior to hibernation, which may be termed the hibernation flight, when areas 4-5 miles from the breeding-places may be invaded and an epidemic of malaria may result. *Anopheles sacharovi*, *A. sergenti* and *A. superpictus* all hibernate as adults, but it is not clear to what extent, if at all, they also hibernate as larvae. Larvae other than those of *A. algeriensis*, Theo., are rarely found during January and February, and hibernation in the larval stage is unimportant. The adults can be destroyed in their winter quarters.

Charts are given illustrating the seasonal incidence of malaria due to *Plasmodium vivax* and *P. falciparum* from 1923 to 1925, and the relation of malarial incidence to the prevalence of *A. sacharovi* and *A. sergenti* in certain localities in 1925. In the coastal plains there is only one period of malarial prevalence, from June to August, the majority of the cases being due to *P. vivax*; in the inland plains there were two epidemics in 1923, one in summer caused mainly by *P. vivax* and the other in autumn caused mainly by *P. falciparum*, but since 1923, the summer outbreak has been negligible as the result of control work, the control of *A. sacharovi* in the spring being easier than the control of *A. sergenti* in the autumn.

ROUBAUD (E.). **L'influence maternelle dans le déterminisme de l'asthénobiose acyclique; métagonie et réactifs métagoniques.**—*C.R. Acad. Sci. Fr.*, clxxxvi, no. 18, pp. 1236-1238. Paris, 1928.

In *Aedes (Stegomyia) argenteus*, Poir., asthenobiosis affects irregularly the primary larvae in the eggs of the same female. Certain eggs contain inactive larvae, incapable of spontaneous hatching without an external stimulus, whilst others of the same batch of eggs, or of different ones, hatch and develop spontaneously [*R.A.E.*, B, xv, 161]. *Phlebotomus papatasi*, Scop., can produce both active larvae that develop continuously, and inactive ones, the development of which ceases at the fourth instar and cannot continue without the intervention of a long period of reactivating athermobiosis [xv, 133; xvi, 56].

The author's investigations lead him to believe that in these cases the development of the insect is determined by maternal conditions. The toxic action on the ova during a too prolonged stagnation in the maternal abdomen before oviposition causes torpid development. If the development of the egg in the mother takes place rapidly and oviposition occurs in the normal, speedy manner, subsequent development is uninterrupted. On the other hand, when ovular development is slow, oviposition is delayed, subsequent development ceases sooner or later, and the sexual state can only be obtained by the intervention of specific reactivating stimuli.

This opens up possibilities of explanations of such phenomena as the determination of asexual, apterous castes. The author uses the term "metagonv" for the supplementary, reactivating process. The metagonic stimuli causing resumption of development are comparable, in their biological rôle and importance, to the fertilisation or other initial stimulus that makes possible the beginning of ontogenesis in the ovum in normal fertilisation or in parthenogenesis.

[PAVLOVSKIĬ (E. N.).] Павловский (Е. Н.). **Insects and Infectious Diseases of Man.** [In Russian.]-Cr. 8vo, 187 pp., 55 figs., 49 refs. Moscow, Narkomzdrav R.S.F.S.R., 1928. Price 1r. 75 k.

This book is intended as a guide to the medical profession in dealing with infectious diseases transmitted by insects in Russia. An outline is given of the bionomics of the insect concerned in each case, with recommendations for its control. The various stages of the insects are described and a number of keys to them are given.

In dealing with the sandflies the author points out that *Phlebotomus crimicus*, Shtefko & Mink. [R.A.E., B, xiv, 190] is allied to *P. perniciosus*, Newst.

[OLENEV (N. O.).] Оленев (Н. О.). **On the Classification and Geographical Distribution of Ixodids. II.** [In Russian.]-C.R. Acad. Sci. U.R.S.S., 1928, pp. 29-34, 4 figs., 1 ref. Leningrad, 1928.

The genus *Haemaphysalis* is represented by 9 species in Russia, viz., *H. inermis*, Bir., *H. warburtoni*, Nutt., *H. cinnabarina punctata*, C. & F., *H. sulcata*, C. & F., *H. concinna*, Koch, *H. leachi*, Aud., *H. numidiana*, Neum., and two new species, *H. cholodkovskii* from goats and *H. caucasica* from *Lepus* sp., which are described in French.

The identity of *Ixodes arenicola*, Eichw., is discussed; the author suggests that it is a synonym of *Hyalomma aegyptium*, L.

PAVLOVSKIĬ (E. N.) & STEIN (A. K.). Павловский (Е. Н.) и Штейн (А. К.). **On the Rôle of Turkestan Ticks of the Genus *Ornithodoros* in the Pathology of Man.** [In Russian.]-*Pensée méd. Usbéquistane*, ii (vi), no. 3, pp. 31-37, 32 refs. Tashkent, December 1927.

[MOSKVIN (A. I.).] Москвин (А. И.). **The Action of the Bite of *Ornithodoros papillipes*, Bir., on the Skin of Laboratory Animals.** [In Russian.]-*Ibid.*, pp. 38-42, 7 refs.

In the first of these papers the effects of the bites of *Ornithodoros tholozani*, Lab. & Mégn., and *O. papillipes*, Bir., on the skin of man are discussed and compared. The authors briefly review the work done by others with regard to these ticks and relapsing fever. Although both species were received from Turkestan, *O. papillipes* was greatly in the majority, and it is therefore suggested that the ticks used by Latuishev might have been this species [cf. R.A.E., B, xvi, 110, etc.].

EDWARDS (F. W.). ***Simulium* Larvae and Pupae found on a Crab.**-*Entomologist*, lxi, no. 777, p. 42. London, February 1928.

Larvae and pupae of what appears to be a variety of *Simulium hirsutum*, Pomeroy, were found attached to crabs (*Potamon niloticum*) taken in a river in Uganda. Most of the larvae had settled on the under side of the crab, at the base of the legs; none was found under the folded abdomen. These larvae will apparently attach themselves to any suitable object in the water, and their occurrence on crabs must be considered accidental.

TOWNSEND (M. T.). **Seasonal Abundance and Vertical Migrations of *Lucilia caesar* Linn. and other Insects in an artificial Grove.**—*Ann. Ent. Soc. Amer.*, xxi, no. 1, pp. 121-131, 2 charts, 7 refs. Columbus, Ohio, March 1928.

Studies were carried out in Illinois in 1922 in which an attempt was made to correlate the distribution of insects trapped at different levels in a forestry plot with the environmental factors. The apparatus used and the methods employed are briefly described. *Lucilia caesar*, L., which occurred in some abundance from 13th April to 8th December, showed indications of about nine broods during the season. It was more abundant near the ground than in the tree-tops, and occurred in larger numbers in the spring and autumn than during midsummer, being in general more numerous in dry, warm weather with a high percentage of sunshine, a steady barometer and moderate wind. *Chrysomya macellaria*, F., was taken only late in the summer and chiefly from the ground trap; a few were taken at 25 ft. and one in the tree-tops.

MYERS (J. G.). **A Peculiar Feeding-Habit of *Culex pipiens*, L.**—*Ent. Mo. Mag.*, lxiv, pp. 57-58. London, March 1928.

Culex pipiens, L., was observed feeding on milk in North Essex. The mosquitos were invariably most numerous in the vicinity of long-standing milk, though this was not necessarily always in the same position in the dairy. In no case, among hundreds, was one seen feeding at freshly exposed milk or on a jar of cream. No traces of cream were noted in dissected individuals. The mosquitos stand on the covering layer of cream and pierce it to the milk beneath; the skin formed by the cream is apparently an essential condition for feeding, as they did not feed on skim milk from which the cream layer had been removed. The conditions are strikingly analogous to those offered by the vertebrate host, *i.e.*, a skin and a liquid beneath, and are exploited solely by the females.

[SHARHOV (S. D.).] Шaxов (С. Д.). **The Black-legged Malaria Mosquito (*Anopheles plumbeus*, Hal.) in the Ukraine.** [In Russian.]—*Rev. Microbiol. Epidémiol. Parasit.*, vii, no. 1, pp. 23-34, 12 figs., 11 refs. Saratov, 1928. (With a Summary in English, p. 137.)

Anopheles plumbeus, Steph., is recorded from the Ukraine, where it breeds in hollows of various hard-wood trees. The various stages are described. Hibernation is believed to occur in the larval stage, as no further development was noticed in Kharkov after September or October. Quite young larvae were found at this time under natural conditions, and under laboratory conditions the transformation to the pupal and adult stages also ceased, though larvae kept at room temperatures continued feeding. *Aedes* (*Finlaya*) *geniculatus*, Ol., and *A. (Ochlerotatus) pulchritarsis*, Rond., were found in association with *Anopheles plumbeus*.

[SMORODINTZEV (I. A.) & ADOVA (A. N.).] **Сморозинцев (И. А.) и Адова (А. Н.). Refraction of Turf-pit Waters in Connection with the Application of the Measurement of Refraction in Biology.** [In Russian.]—*Russ. J. Trop. Med.*, v, no. 10, pp. 635–638, 11 refs. Moscow, 1927. (With a Summary in French, p. 675.)

The work in connection with the composition of water in turf-pits has been continued [*R.A.E.*, B, xv, 188; xvi, 96, etc.]. A comparison of sphagnum and sedge peat water shows that the former has a higher coefficient of refraction. The refractive index is higher in turf-pits that are being worked than in older ones of the same type. The highest coefficient of refraction was found in a concrete reservoir and the lowest in certain sedge peat bogs and clay pits. A high coefficient of refraction with a low content of mineral constituents indicates unsuitable conditions for the development of Anopheline larvae.

[ADOVA (A. N.) & RAVICH-SHCHERBO (M. I.).] **Адова (А. Н.) и Равич-Щербо (М. И.). Oxygen Content of Turf-pit Waters.** [In Russian.]—*Russ. J. Trop. Med.*, v, no. 10, pp. 639–642, 2 figs., 6 refs. Moscow, 1927. (With a Summary in French, p. 675.)

The water in sedge peat bogs has a higher oxygen content than that of the sphagnum peat bogs, and this content is also higher in new pits than in old ones. There is an inverse relation between the percentage of oxygen and the organic constituents in the water. A low percentage of oxygen in the water combined with a high percentage of organic constituents in the dry residue is unfavourable for the development of Anopheline larvae.

CHAMBERLAIN (W. P.) & CURRY (D. P.). **Mosquito Control.**—*Rep. Hlth. Dept. Panama Canal 1926*, pp. 17–22. Balboa Heights, C.Z., 1928.

In 1926 the rate of malaria infection among Canal employees touched the lowest point ever reached since work on the Isthmus of Panama was undertaken by the United States. While the number of mosquitos varies from year to year, it is probable that the reduced rate is chiefly due to the great extensions and improvements in the treated areas that have taken place in recent years, concrete bottomed ditches and subsoil tile drains having greatly simplified the maintenance of the drainage systems [*R.A.E.*, B, xv, 105]. Details of the progress of some of this work are given.

On the Atlantic side many new ditches were made in the low-lying swampy cattle pastures, and although these do not completely dry the land, they admit tidal fluctuations and also so lower the water level as to render the water more foul and less fit for the breeding of *Anopheles*. Canals made through mangrove swamps to establish a freer circulation of salt water have almost completely abolished mosquito breeding. Observations over a long period have shown that the oiling of the inlets of Miraflores Lake should be carried out at regular intervals of 10 days, though longer intervals might be satisfactory. It is not possible to use Paris green for this work, since the maximum breeding of Anophelines occurs during the season of relatively excessive rainfall

when no dust is available and when special and expensive precautions would be necessary to keep any imported diluent dry. Also when arsenic is used in areas covered with vegetation, this must be dry or the greater part of the powder adheres to the moist surfaces of the leaves and does not reach the water. Moreover, Paris green appears to be mainly effective against Anophelines, whereas in the Canal Zone it is necessary, as a measure of comfort, to control Culicines also. The oil also affects eggs and pupae and is believed to deter the females from ovipositing on water for some time after it is applied. The means of transporting the oil to the areas to be treated and the method of applying the hot oil from a tank mounted on a rowing boat are described.

For such oiling as is done in open streams and ditches, an oil soaked mop or drag is used. This cleans and oils at the same time and mixes the oil with the water, algae, and debris so as to ensure its thorough larvicidal action. For the past two or three seasons malaria-carrying mosquitos have rarely been caught within the towns, but *Aedes taeniorhynchus*, Wied., and *Taeniorhynchus* (*Mansonia*) *titillans*, Wlk., are very annoying and are able to fly very long distances from their breeding-places [R.A.E., B, xv, 104]. *T. titillans* breeds in the water-lettuce (*Pistia*) and floating sedge-grass islands of the more remote parts of Gatun Lake. Its breeding in the roots of *Pistia* in the quiet inlets of Miraflores Lake is apparently controlled by the oiling.

BERTRAM (B.). **Mosquito Control in the Municipality of Lane Cove, New South Wales.** *Proc. Linn. Soc. N.S.W.*, 1927, lii, pt. 4, pp. 563-569, 1 map, 2 pls., 4 refs. Sydney, December 1927.

Lane Cove, a suburb of Sydney, is only four square miles in extent, but comprises a variety of topographical features, an account of which is given. The ten mosquitos recorded from the locality included *Lutzia halifaxi*, Theo., the larvae of which are predacious on those of other mosquitos, and *Anopheles annulipes*, Wlk., but the only one of importance was *Culex fatigans*, Wied., so that the control measures were confined to this species. The extent of pollution is apparently the dominant factor in determining the extent of breeding of *C. fatigans* in creeks and open drains. The larvae do not occur in clear unpolluted water containing numerous predatory aquatic insects except very early in the season before the predacious species become abundant. In almost all cases polluted waters contained larvae at some time during the season.

The remedial measures included oiling, draining and clearing. As a result of laboratory tests it was found best to use a mixture of 3 parts unrefined kerosene and 1 part tar oil. Crude oil was too heavy and flocculent, allowing a clear area to form at the edge of the jar containing the larvae, while they were able to live 3 days under the oil film and to pierce the film with their siphons. Unrefined kerosene killed the larvae in 13 minutes when used alone and in 7 minutes when mixed with the tar oil. The tar oil alone did not form a sufficiently good film.

Owing to the success obtained it has been decided to extend the work, the effect of which was noticed at some considerable distance from the breeding areas, thus indicating that the range of flight of *C. fatigans* is much greater than was previously thought.

SENIOR-WHITE (R.). **Studies in Malaria, as it affects Indian Railways.**
 —*Ind. Med. Gaz.*, lxiii, no. 2, pp. 55-72, 11 figs., 5 charts, 10 refs.
 Calcutta, February 1928.

This paper gives an account of several malaria control campaigns and malaria surveys carried out by the author on the Bengal-Nagpur Railway, with the object of showing that malaria control on railways in India is not only practicable but economic. The first campaign, which is described in some detail, was carried out during the construction of a railway through the intensely malarious country at the foot of the Eastern Ghats in northern Madras. Sites were selected for the construction camps in which the labour was concentrated, drains were made and crude oil was applied regularly to the breeding-places of all Anophelines that were considered to be potential vectors of malaria. The daily incidence of malaria never reached 2 per cent. of the total strength, and there was no mortality from the disease, while the monthly cost of the measures only amounted to about 27 shillings per mile of construction. The Anophelines occurring in the district were *Anopheles culicifacies*, Giles, *A. funestus*, Giles, *A. maculatus*, Theo., *A. theobaldi*, Giles, *A. maculipalpis*, Giles, *A. hyrcanus* var. *sinensis*, Wied., *A. barbirostris*, Wulp., *A. vagus*, Dön., *A. pallidus*, Theo., *A. karwari*, James, and *A. fuliginosus*, Giles; the first five of these were treated as potentially dangerous. The most important was *A. funestus*, larvae of which swarmed in all suitable streams, while *A. culicifacies* seemed to be of minor importance, although it bred very freely along the sandy banks of a river when the water was low, where oiling was impracticable. The second campaign described was in connection with the construction of a tunnel in Chota Nagpur; in a few months malaria, which had presented a very serious problem during the first year of the work, was almost eradicated by the control of Anophelines, principally *A. funestus*, *A. culicifacies* and *A. theobaldi*.

The second part of the paper deals with malaria on railways open to traffic, the first example being a survey of the conditions on a stretch of line in Chota Nagpur, in which it is shown that malarious wayside stations are responsible for a large proportion of the malaria among the running staff at a division terminal station. The cost of controlling mosquito breeding at wayside stations is not out of proportion to the number of the staff benefited when this is taken into consideration. The second example is an account of a campaign carried out at a station in Chota Nagpur, where work was almost brought to a standstill by malaria among the staff, numbering about 86. The Anophelines present were those mentioned above, with the exception of *A. maculatus* and *A. karwari*, and in addition *A. subpictus*, Grassi (*rossi*, Giles) and *A. tessellatus*, Theo.

The only Anophelines that breed in freshly excavated borrow pits are *A. subpictus* and *A. vagus*, which are harmless, but old borrow pits full of vegetation may contain, in addition to these, *A. culicifacies* and *A. funestus*, which are dangerous malaria carriers, *A. barbirostris*, *A. hyrcanus* var. *sinensis*, *A. fuliginosus* and *A. pallidus*. The margins of borrow pits near stations should be kept free from vegetation, and, if possible, they should be filled, ashes being suitable for this purpose; if ashes are dumped in the borrow pits daily, poisonous substances seem to leach out of them that have an inhibitory effect on mosquito breeding.

Although *A. fuliginosus* has been proved to be a vector of malaria in nature, it appears to be of little practical importance, and it seems probable that at the time when it reaches its maximum abundance, in winter, the temperature is unfavourable for the development of sporozoites. In two of the localities in which the author carried out control measures this species was ignored without ill results. Near Howrah it does not appear in numbers until after the peak of the curve of malaria incidence each year.

Malaria Control in Ceylon. Memorandum prepared by the Department of Medical and Sanitary Services, June, 1927.—Fol., 6 pp. Colombo, Govt. Printer, 1927.

This is a brief summary of the physical, climatic and economic conditions of Ceylon, and the measures taken by the various Government Departments to combat malaria, which include the control of Anophelines and the distribution of quinine.

DE BOER (H. S.). **Malaria and its Control on Mombasa Island.**—*Kenya & E. Afr. Med. J.*, v, no. 1, pp. 2-11, 1 map. Nairobi, April 1928.

Malaria has long been known to occur at Mombasa, the malignant tertian form of the disease being predominant. No systematic attempt to control it had apparently been made prior to 1925. A survey of Anopheline breeding-places on the Island was carried out in 1924; *Anopheles gambiae*, Giles (*costalis*, Theo.) greatly predominated, but *A. mauritanius*, Grp., and *A. cinereus*, Theo., were also present, though in very small numbers. *A. gambiae* bred only in comparatively clean water open to sunshine, and was never found in domestic vessels or barrels or in sullage pits. During the rainy season Anophelines were found breeding all over the Island in temporary pools, mostly small and artificial; these pools were only dangerous so long as the rains were not heavy but were fairly regular. Some breeding-places, however, contained water during the whole or the greater part of the year, and enabled the number of adult Anophelines to be maintained at a fairly high level throughout the dry season, so that a very rapid increase could take place with the advent of the rains.

Control measures were begun in 1925 and continued in 1926 and 1927. Most of the permanent breeding-places were filled in or drained, and those that remained were oiled regularly. The result of these measures was that whereas in 1924 Anopheline larvae were brought in almost every day, in 1927 they were only brought in some half-a-dozen times, the collectors being the same in each year, while only two adult Anophelines were captured during the rainy season of 1927, with some 2,000 other mosquitos.

SENEVET (G.) & PRUNELLE (M.). **Une nouvelle espèce d'anophèle en Algérie, *Anopheles marteri* n. sp.**—*Arch. Inst. Pasteur Algérie*, v, no. 4, pp. 529-533, 4 figs. Algiers, December 1927.

The larva and both sexes of the adult of *Anopheles marteri*, sp. n., are described. The larvae are very abundant in mountain streams in the Tell, Algeria, in April and May.

SENEVET (G.) & PRUNELLE (M.). **A propos de la larve de *Anopheles algeriensis* Theobald 1903.**—*Arch. Inst. Pasteur Algérie*, v, no. 4, pp. 534–537, 1 fig., 2 refs. Algiers, December 1927.

Certain peculiarities of the structure of the larva of *Anopheles algeriensis*, Theo., are described from an Algerian specimen; these agree with the descriptions given by Cuboni [*R.A.E.*, B, xiv, 83] and Edm. & Et. Sergent, which are quoted. A key is given to the larvae of the species of *Anopheles* with unspotted wings that occur or might occur in Algeria, viz., *A. plumbeus*, Steph., which has not yet been recorded, *A. sacharovi*, Favre (*elutus*, Edw.), which has been recorded only once, *A. bifurcatus*, L., *A. marteri*, S. & P., and *A. algeriensis*.

REMLINGER (P.). **La protection du Maroc contre la fièvre jaune.**—*Bull. Acad. Méd.*, 1927, no. 38, pp. 435–442. Paris, 1927. (Abstract in *Bull. Inst. Pasteur*, xxvi, no. 7, pp. 333–334. Paris, 15th April 1928.)

Yellow fever has never occurred in Morocco, although all the conditions are favourable to it and *Aedes argenteus*, Poir. (*Stegomyia fasciata*, F.) is extremely common. The immunity that the country has enjoyed hitherto is attributable to the fact that until recent years it has been comparatively isolated. The only way in which yellow fever is likely to be introduced is by shipping, and it is desirable that any person suffering from fever on board a ship should be protected from the bites of mosquitos. The control of *Aedes argenteus* would result in the disappearance of several conditions that are apparently due to dengue.

LEGENDRE (J.). **Le paludisme chez les Européens en Haute-Volta.**—*Bull. Soc. Path. exot.*, xxi, no. 3, pp. 207–210, 1 ref. Paris, 1928.
Le paludisme chez les indigènes en Haute-Volta.—*T.c.*, no. 4, pp. 309–312, 1 ref.

From 26 months' study in the Upper Volta, French West Africa, the author concludes that malaria is comparatively rare both among Europeans and natives and that a large proportion of the cases hitherto diagnosed as malaria were in reality dengue or influenza. The infrequency of malaria is due to the scarcity of Anophelines, which may be attributed to limited breeding-places; the species captured at Ouagadougou were *Anopheles gambiae*, Giles (*costalis*, Theo.), *A. funestus*, Giles, and *A. mauritanus*, Grp. Although the infection is generally due to *Plasmodium falciparum* (*praecox*), the cases are for the most part benign and yield rapidly to moderate doses of quinine.

ROUBAUD (E.). **Adaptation spontanée de la punaise des lits (*Cimex lectularius* Merret) en milieu obscuricole, aux rongeurs domestiques.**—*Bull. Soc. Path. exot.*, xxi, no. 3, pp. 224–226, 2 refs. Paris, 1928.

Cimex lectularius, L., has been found breeding in numbers in a dark, warmed cellar in Paris on white mice. The infestation probably originated from other rodents at liberty in the cellar. Probably owing to the continuous darkness and presence of the hosts, *C. lectularius*, when feeding on small rodents, is active both night and day. The bugs were poorly nourished and unable to withstand long fasts, 50 per cent. of those isolated in tubes dying within 7 days.

ROUBAUD (E.). **Foyer de développement de *Xenopsylla cheopis* à Paris. Observations sur la biologie de cette puce.**—*Bull. Soc. Path. exot.*, xxi, no. 3, pp. 227-230, 6 refs. Paris, 1928.

An extensive breeding centre of *Xenopsylla cheopis*, Roths., has been discovered in a cellar in Paris near a central heating plant, where an artificial temperature of 73-77° F. is maintained throughout the winter and where rats are numerous. The fleas were observed both independently in different parts of the cellar and in empty cages of various animals, as well as in cages of white mice. No fleas were taken on guineapigs exposed in the cellar, but the author found that they were greatly attracted to the decomposing bodies of dead mice. They were readily captured by placing dead mice in metal containers 6 or 8 inches high, into which they climb; they cannot easily jump so high, so that their presence can be determined by shaking the container. The fleas, most of which were females, are apparently attracted by the odour of animal putrefaction for reproductive rather than for alimentary purposes. It is possible that fleas that had developed as larvae on the bodies of rodents that had died of plague might themselves transmit the disease.

The author considers this breeding centre to be of long standing, and to be merely representative of many others, and believes that *X. cheopis* can play an important part in the plague epidemiology of western Europe as it does in the warmer regions of its better known areas of distribution.

MORGAN (E. L.) & MACKERRAS (I. M.). **Routine Examination of Rodents and their Ectoparasites.**—*Rep. Direct. Publ. Hlth. N.S.W.* 1926, pp. 144-145, 1 chart. Sydney, 1928.

Details are given of the numbers of each species of flea found on rats and mice examined for the presence of plague in Sydney during 1926, and the records for the years from 1909 to 1925 are summarised for comparison. During the 18 years 20,676 fleas have been collected, 44.55 per cent. being *Xenopsylla cheopis*, Roths., 36.48 per cent. *Leptopsylla segnis*, Schönh. (*musculi*, Dug.) and 18.22 per cent. *Ceratophyllus fasciatus*, Bosc.

MACKERRAS (I. M.). **Tick Paralysis in Man in Australia.**—*Rep. Direct. Publ. Hlth. N.S.W.* 1926, pp. 168-169, 12 refs. Sydney, 1928.

This is a review of the observations of various authors on tick paralysis in man in Australia, caused by *Ixodes holocyclus*, Neum., and the experimental production of the disease by this tick in dogs [*R.A.E.*, B, xiii, 9, 28; xv, 32; etc.].

FRANTZEN (W.). **Die geographische Verbreitung und wirtschafts-geographische Bedeutung der Tsetse-Fliege.** The geographical Distribution and economic Importance of Tsetse-flies.—*Matér. Etude Calamités*, iv, no. 16, pp. 293-338, 1 map, refs. Geneva, 1928. (With Summaries in French and English.)

This is a review of the tsetse-fly situation in tropical Africa, based on the literature. The distribution of *Glossina palpalis*, R.-D., and

G. morsitans, Westw., and the types of country in which they occur are described, and the importance of these tsetse-flies as vectors of sleeping sickness and trypanosomiasis of animals, their effect on the commercial development of the infected areas and the methods of combating both the flies and the diseases are discussed.

PAPERS NOTICED BY TITLE ONLY.

- [METALNIKOV (S. I.).] **Метальников (С. И.). Immunity as a protective Reaction in Invertebrates.** [*In Russian.*]—*Bull. Inst. sci. Lesshaft*, xiii, pt. 1, pp. 109–138, 4 figs., 28 refs. Leningrad, 1927. (With a Summary in French.) [*Cf. R.A.E.*, B, xvi, 1.]
- SCOTT (H.). **Occurrence of the Bat-bug, *Loxaspis mirandus*, in Portuguese East Africa, and Note on the Association of some Coleoptera with Bats.**—*Ent. Mo. Mag.*, lxiv, pp. 108–109. London, May 1928.
- ROSS (Sir R.). **Malaria-control in Malaya and Assam. A Visit of Inspection, 1926–27.**—*Malayan Med. J.*, iii, no. 1, pp. 40–53. Singapore, March 1928. [*See R.A.E.*, B, xvi, 33.]
- MACKERRAS (I. M.). **The Mosquitoes of the Sydney District.**—*Rep. Direct. Publ. Hlth. N.S.W. 1926*, pp. 165–168. Sydney, 1928. [*See R.A.E.*, B, xv, 60.]
- PINTO (C.), DE BARROS BARRETO (J.) & FIALHO (A.). **Sobre a frequencia das especies de pulgas de ratos, verificados no Rio de Janeiro.** [On the Abundance of the Species of Rat Fleas found in Rio de Janeiro.]—*Sciencia med.*, vi, no. 3, pp. 110–116. Rio de Janeiro, March 1928. (With a Summary in English.) [*Cf. R.A.E.*, B, xvi, 171.]
- WAGNER (J.). **Contribution to the Knowledge of the Endoskeleton of Insects. The Endoskeleton of the Head of the Flea.** [*In Serbian.*]—*Acta Soc. ent. serb.*, ii, pt. 1, pp. 4–10, 6 figs., 4 refs. Belgrade, 1927. (With a Summary in German.)
- BARANOV (N.). **Some Morphological Peculiarities of the Family Simuliidae and their Importance in the Classification of this Family.** [*In Serbian.*]—*Acta Soc. ent. serb.*, ii, pt. 1, pp. 19–25, 12 figs., 2 refs. Belgrade, 1927. (With a Summary in German.)
- [GLADINA (S.).] **Гладина (С.). Experimental Observations on the Effect of the Beetle, *Paederus fuscipes*, Curt. (Staphylinidae), on the Eyes of the Rabbit.** [*In Russian.*]—*Rev. Microbiol. Epidémiol. Parasit.*, vii, no. 1, pp. 18–22, 6 refs. Saratov, 1928. (With a Summary in German, p. 136.)
- [MAGNITZKIĬ (V. I.) & GUTZEVICH (A. V.).] **Магницкий (В. И.) и Гутевич (А. В.). On the Question of the Variation of some Characters of the Species of the Genus *Phlebotomus*.** [*In Russian.*]—*Rev. Microbiol. Epidémiol. Parasit.*, vii, no. 1, pp. 35–45. Saratov, 1928. (With a Summary in English, pp. 137–138.)
- PERFILIEV (P. P.). **Sur l'anatomie des phlébotomes [*Phlebotomus*].**—*Bull. Soc. Path. exot.*, xxi, nos. 2 & 3, pp. 159–171, 254–257, 3 pls., 14 refs. Paris, 1928.

FERGUSON (E. W.). **Dengue Fever—the 1925-26 Outbreak in New South Wales.**—*Rep. Direct. Publ. Hlth. N.S.W. 1926*, pp. 154-164, 1 map. Sydney, 1928.

An account is given of an outbreak of dengue that occurred in north-eastern New South Wales in 1925-26, spreading to that State from Queensland, and previous outbreaks of the disease in eastern Australia are briefly reviewed. Five great epidemic waves have occurred, separated by intervals of about 10 years. In New South Wales each epidemic has been limited to a single season, but in Queensland each has spread over two or three years, the intervals between them being less clearly marked. This difference in the duration of the outbreaks is associated with the bionomics of the vector, *Aedes argenteus*, Poir. (*aegypti*, L.); in the warmer parts of Queensland this mosquito breeds all the year round and the epidemic does not end until almost all susceptible persons have been infected, but in New South Wales and probably in parts of southern Queensland it breeds only during the warmer months and passes the winter in the egg stage. In the 1925-26 outbreak no cases of dengue occurred above an altitude of about 3,000 feet, this being the approximate limit of the breeding of *A. argenteus* in New South Wales. The known distribution of *A. argenteus* in New South Wales corresponds closely with the extent of the 1925-26 outbreak of dengue, and there appears to be a close correspondence between the distribution of this mosquito and the disease in other States also, which confirms the belief that it is the only vector in Australia.

Epidemiological observations made during the outbreak support the findings of Chandler and Rice [*R.A.E.*, B, xi, 143] that *A. argenteus* is infective during the first three days after feeding on a person infected with dengue, although other workers have found that there is an incubation period of 11 days in the mosquito [*R.A.E.*, B, xiv, 124; etc.]. The author considers it probable that there may be two periods of infectivity, an early period of 1-3 days in which infection is due to contaminative inoculation, and a second following a true incubatory period of not less than 11 days.

Reports on the course of the outbreaks of dengue and the prevalence, breeding-places and control of *Aedes argenteus* and other mosquitos in various towns are appended. In one town in which some degree of mosquito control had been carried out only 10-15 per cent. of the population became infected, as compared with 85-95 per cent. in neighbouring towns in which no control measures were in force.

SHORT (R. P. M.). **The Cattle Tick Pest in Australia.**—*J. Council Sci. & Ind. Res.*, i, no. 3, pp. 163-167, 2 pls., 2 refs. Melbourne, February 1928.

This is a brief review of the organisation of measures against the cattle tick [*Boophilus annulatus australis*, Fuller] in New South Wales and Queensland under the auspices of the Commonwealth Council for Scientific and Industrial Research (formerly Advisory Council of Science and Industry). In October 1926 the Cattle Tick Control Commission was appointed to exercise general direction and supervision over matters pertaining to the eradication of the tick. The Commission is carrying out a campaign in New South Wales, the first object of which is to prevent the southward spread of the tick ;

subsequently steps will be taken to eradicate the tick in the north-eastern districts of the State, and then to extend the operations to southern Queensland, where work is at present being done by the State Government.

Investigations on cattle dips have been carried out since 1919 by the Cattle Tick Dip Committee, which was appointed in December of that year. A summary is given of the experiments that have been made by the Committee and of the findings based on the results obtained. Observations showed that dipping in arsenical solutions of the concentrations commonly employed does not cause injury to the skin of cattle unless other factors, such as hot and humid weather or driving prior or subsequent to dipping, are present. No single treatment with fluids containing arsenic (arsenious oxide) in concentrations of 4–10 lb. to 400 gals., or up to five times the prescribed standard proportion of saponified tar, will kill all ticks in all stages of development on an infested animal; during the second moult a phase exists in which the ticks are resistant to the action of arsenical fluids, and this apparently accounts for the occurrence of adult female ticks after treatment, some of which lay a full complement of viable eggs. Although two treatments, at an interval of two or three days, with a dip containing 8 lb. arsenic, $\frac{1}{2}$ gal. Stockholm tar and 5 lb. potash soap to 400 gals. do not actually kill all the ticks present on an animal at the time of the initial treatment, they destroy the fertility of eggs that may be laid by the survivors. Treatment with the above arsenical fluid affords protection against re-infestation by larval ticks for two days. Heavy rain falling on cattle more than two hours after treatment does not diminish its efficacy provided that the animals have become dry in the meantime. The minimum proportion of arsenic (in conjunction with Stockholm tar and potash soap) necessary to prevent the propagation of all ticks by two sprayings of the animals at intervals of three days is 8 lb. to 400 gals. The omission of Stockholm tar and soap from the dipping fluid diminishes its efficiency, but resin may be substituted for Stockholm tar, 4 lb. resin having been found more effective than $\frac{1}{2}$ gal. Stockholm tar; weight for weight, soap is not an efficient substitute for Stockholm tar. Oxidation in dipping baths can be prevented or rectified by the addition of 2 per cent. skim milk or butter-milk, or an equivalent amount of casein or dried butter-milk.

A map of the tick-infested areas in Australia shows that the tick occurs in a broad belt along the coast from the extreme north of New South Wales through Queensland and the Northern Territory to the northern part of Western Australia (about 19° S. Lat.).

BANZHAF (W.). **Biologische Beobachtungen an Rachenbremsen.** [Biological Observations on Species of *Cephenomyia*.]—*Intern. ent. Z.*, xxii, no. 8, pp. 85–91, 1 pl., 1 fig., 8 refs. Guben, 22nd May 1928.

The 4 species of *Cephenomyia* attacking deer in Europe are *C. stimulator*, Clark, most abundant on roe deer, *C. rufibarbis*, Mg., on red deer, *C. ulrichi*, Brauer, on elk, and *C. trompe*, L., on reindeer. There are also two species in America. The larvae are deposited in the nostrils of the host, where they hibernate and undergo two moults, leaving their host to pupate under moss or foliage. Pupation lasts 21–40 days according to the species, and the adults generally emerge during the morning hours. Animals that are heavily infested may die.

VAN ZWALUWENBURG (R. H.). **The Interrelationships of Insects and Roundworms.**—*Bull. Expt. Sta. Hawaiian Sugar Planters' Assoc.*, Ent. Ser. no. 20, 68 pp., 13 pp. refs. Honolulu, January 1928.

This is a survey of the literature dealing with the relationships between insects and Nematodes (in the broad sense, including Nematoda, Gordiacea and Acanthocephala) throughout the world. The types of association dealt with are primary parasitism, in which the Nematode usually causes the death or at least the sterilisation of the insect host; secondary parasitism, in which the insect serves as an intermediate host for a Nematode of which the primary host is a higher animal, often a mammal, and in which the effect on the insect is usually benign; internal mechanical association, in which the Nematode merely passes through the digestive tract of the insect, which plays no other part in its life-history than to distribute it; external mechanical association, in which the insect acts as a carrier for a Nematode that requires a site for transformation or transportation to new food supplies; and commensalism, in which the Nematode lives in the nest or burrow of an insect. A few of the more interesting relationships between Nematodes and insects of various orders are discussed, and some 750 species of insects are listed with the Nematodes that have been recorded as associated with them, a few new host records being included.

FIELDING (J. W.). **Additional Observations on the Development of the Eye Worm of Poultry.**—*Aust. J. Exptl. Biol. Med. Sci.*, v, pt. 1, pp. 1-8, 11 figs., 9 refs. Adelaide, 16th March 1928.

The eggs, four larval instars and adults of *Oxyspirura parvovum* are described, the complete development of this Nematode of poultry in its intermediate host, *Pycnoscelus (Leucophaea) surinamensis*, L., having been observed in North Queensland [R.A.E., B, xvi, 102]. The larvae of the Nematode become infective to poultry in the third instar, and the third moult begins on the day after reaching the definitive host.

PARMAN (D. C.), ABBOTT (W. S.), CULVER (J. J.) & DAVIDSON (W. M.). **Ineffectiveness of Internal Medication of Poultry for the Control of External Parasites.**—*Tech. Bull. U.S. Dept. Agric.*, no. 60, 24 pp., 2 figs. Washington, D.C., February 1928.

A description is given of a series of tests to determine whether any control of lice, fleas or mites on fowls could be obtained from the internal administrations of substances in food or water. The tests were made with a great variety of materials, but none of them proved of any practical value.

CÉSARI (—). **A propos des leishmanioses canines.**—*Rev. Hist. nat. appl.*, (1) ix, no. 4, pp. 105-113. Paris, April 1928.

The author gives a brief account of the various forms of leishmaniasis in man and animals, in which he accepts the identity of the causal organism of visceral canine leishmaniasis with that of infantile kala-azar (*Leishmania infantum*) and of the causal organism of cutaneous canine leishmaniasis with that of Oriental sore (*L. tropica*), and discusses the

relation of *Phlebotomus* to the transmission of these diseases. It has been shown that Oriental sore is transmitted by *Phlebotomus papatasi*, Scop., and *P. perniciosus*, Newst., and there is reason to believe that infantile kala-azar is also transmitted by *P. papatasi* and probably by *P. perniciosus* and *P. minutus*, Rond. In France, *P. papatasi* is common in the Alpes-Maritimes, and it has also been recorded from Hérault and Burgundy; *P. perniciosus* occurs in Corsica and along the Mediterranean coast, and has also been recorded from the department of Oise and near Paris. Some sixty cases of infantile kala-azar have been reported in the south of France, nearly all in the districts around Nice, where the first cases were observed in 1918, and Marseilles; visceral canine leishmaniasis is fairly widespread in these districts, and the author suggests that the origin of infantile kala-azar in France may be attributed to the introduction of infected dogs. Only two cases of Oriental sore have been reported in France and no cases of cutaneous canine leishmaniasis. The relation of dogs to human leishmaniasis requires further investigation. The possibility of *Phlebotomus* biting both dog and man must be considered, although it seems that specific adaptations to different hosts may exist in these sandflies.

SAVORY (T. H.). **The Biology of Spiders.**—8vo, xx+376 pp., 16 pls., 121 figs., 20 pp. refs. London, Sidgwick & Jackson, 1928. Price 16s.

The first three chapters are devoted to an account of the general characteristics of the class Arachnida, with a brief classification of the orders, and of the external and internal structure of spiders. The last chapter includes brief accounts of the scorpions (Scorpionidea), Solifugae, false-scorpions (Chernetidea) and harvesters (Opiliones), all of which are carnivorous, feeding on insects and other Arthropods, and the mites (Acarina); the section dealing with mites, with which the author includes ticks, contains notes on their importance as parasites of man and animals and as vectors of disease.

The remainder of the book comprises a comprehensive general account of the life-history, habits, ecology and evolution of spiders, illustrated by examples from all parts of the world. Spiders do not attack food, clothing, or buildings, the few attempts to use their silk have failed, and the author considers that their occasional captures of noxious insects are counterbalanced by their readiness to eat beneficial ones.

The effect of the bites of spiders is discussed; recent investigations have shown that the only spiders whose bite is normally dangerous to man belong to the genus *Latrodectus*.

ROGERS (Sir L.). **The Yearly Variations in Plague in India in Relation to Climate: Forecasting Epidemics.**—*Proc. Roy. Soc.*, Ser. B, ciii, no. B.721, pp. 42-72, 4 charts, 1 map, 7 refs. London, 1st May 1928.

The author briefly reviews previous work on the relation of climatic conditions to plague in India. There is very little on record regarding the effect of climatic conditions on the yearly variations of plague incidence, and the present paper is devoted to a study of this problem based on statistics for the years from 1897 to 1923. The author's principal conclusions are that the seasonal incidence of plague mortality in different areas of India can be explained by the seasonal variations in

the mean temperatures and humidities, the latter being best expressed as saturation deficiencies, as pointed out by Brooks [*R.A.E.*, B, v, 151], and that the great yearly variations in plague mortality can mostly be explained by studies of these climatic factors, which appear to act through their influence on the life of the rat fleas that carry the infection to man.

JAMES (H. C.). **On the Life-histories and economic Status of certain Cynipid Parasites of Dipterous Larvae, with Descriptions of some new Larval Forms.**—*Ann. Appl. Biol.*, xv, no. 2, pp. 287–316, 12 figs., 22 refs. Cambridge, May 1928.

A description is given of the adult and larval stages of the Cynipid parasites, *Figites anthomyiarum*, Bch., *Kleidotoma marshalli*, Mshl., and an undetermined species of *Kleidotoma*. These species, which attack Dipterous larvae in carrion, were obtained by exposing meat in shallow trays and allowing it to putrefy; the parasites were easily caught owing to their limited power of flight and were transferred to glass breeding tubes, the corks of which were bored, with fine wire gauze fitted across the holes. In the case of the species of *Kleidotoma*, it was necessary to seal down the corks with sealing-wax, since they were found capable of emerging through holes smaller than themselves and of boring through soft materials such as putty. Eggs of the host were introduced into the breeding-tubes on pieces of meat; the species of host most commonly used were *Calliphora erythrocephala*, Meig., *Lucilia sericata*, L., *L. caesar*, L., *Musca domestica*, L., *Sarcophaga carnaria*, L., and *Hydrotaea dentipes*, F. All species of maggots were attacked by the parasites provided that their natural medium was putrefying meat, and a period of 2 or 3 hours was sufficient to ensure oviposition at a laboratory temperature of 60° F. Parasitised larvae were supplied with a fine layer of damp sand in which to pupate, and by this means a number of parasites was reared.

F. anthomyiarum was present in the meat trays from June until about 10th September. In the breeding tubes females lived 8 or 9 days, but they may live for 15 when they have access to decaying meat and no host larvae are introduced, so that oviposition cannot take place; males only lived 5 days in captivity. Eggs, which are laid in larvae of the first and second instars only, are deposited about 2 days after emergence and hatch in 2 to 3 days; more than two were never laid in one larva at a single oviposition, and in no case where two were laid did more than one parasite complete its development, while occasionally both died. The length of the pupal stage is about 20 days, and the entire life-cycle lasts, on an average, 60 days. Hibernation takes place in the larval stage in the host puparium; there are two summer generations and in favourable seasons, possibly a third. The two species of *Kleidotoma* were present in the trays from June until the middle of September, but no males of these species were observed. The eggs of both hatch in about 2 days, and the life-cycle lasts from 70 to 80; there are two generations in a season.

Cynipid parasites appear in considerable numbers during the early stages of putrefaction, when the first batches of Dipterous eggs are hatching, so that oviposition readily occurs in the newly hatched larvae; they are undoubtedly responsible for at least a 30 per cent. diminution in the numbers, being especially valuable in the destruction of *C. erythrocephala* and *L. sericata*. Under both natural and

laboratory conditions approximately 50 per cent. of the parasitised host larvae died, but although the parasite then succumbs with the host, its general effectiveness is maintained by the high fecundity of the female. As the putrefactive processes advance and a large proportion of the host larvae complete their development, Cynipids diminish greatly and are supplanted by such parasites as *Alysia manducator*, Panz., which attacks the full-grown maggots, and *Mormoniella vitripennis*, Wlk. (*Nasonia brevicornis*, Ashm.), a parasite of the pupal stage.

Several experiments were conducted to discover whether *F. anthomyiarum* would oviposit in the phytophagous larva of *Phorbia* (*Hylemyia*) *brassicae*, Bch. Oviposition was only obtained in these larvae after they had been washed to remove the strong odour of cabbage plant sap, and placed in a small quantity of very putrid meat, so that they became coated with the juices, before being transferred to a breeding tube. Most of them survived, and the eggs did not develop in them. It is concluded that the odour of carrion stimulates the female to oviposition, but that there is some condition in the haemocoelic fluid of a phytophagous larva that inhibits the development of parasites accustomed to develop in saprophagous larvae.

NEWMAN (L. J.). **Sheep Maggot Fly Parasite** (*Alysia manducator*).—*J. Dept. Agric. W. Aust.*, v, no. 1, pp. 150–151. Perth, W.A., March 1928.

A consignment of blowfly pupae, parasitised by *Alysia manducator*, Panz., sent to Western Australia from England by the Imperial Bureau of Entomology arrived in good condition; about 250 parasites issued from the consignment and oviposited on locally reared blowfly larvae, and from these about 180 parasites were bred out. These were in turn put in cages with *Lucilia sericata*, Mg. (European greenbottle) and *Chrysomya albiceps*, Wied. (*Pycnosoma rufifacies*, Macq.) (Australian greenbottle). The eggs of *A. manducator* are laid singly in the host larvae 1 to 2 days after emergence, the adults emerging from the puparia. It is hoped that this parasite will be more effective than *Mormoniella vitripennis*, Wlk. (*Nasonia brevicornis*, Ashm.), which, although it has become established and has been distributed in thousands, only attacks such pupae of the blowfly as are not buried in the soil [*cf. R.A.E.*, B, x, 2].

BRITTON (W. E.). **European Hen Flea in Connecticut**.—*J. Econ. Ent.*, xxi, no. 2, p. 437. Geneva, N.Y., April 1928.

Ceratophyllus gallinae, Schr. (European hen flea) is recorded as attacking man. The fleas were very numerous in a garden that had been manured with droppings brought from a neighbouring henhouse.

[HOARE (C. A.).] **Гоар (C. A.). The Family Trypanosomidae, Doflein.** [*In Russian.*]—*Russ. Arkh. Protist.*, v, supplmt., reprint, 41 pp., 19 figs., numerous refs. Moscow, 1926. [Recd. 1928.]

This is a general account of the various genera of these Protozoa, with descriptions of the species and notes on their biology and intermediate and definitive hosts.

[GRIDNEV (V. M.).] Гриднев (В. М.). **The Epidemiology of Papataci Fever in Tiflis.** [In Russian.]—*Russ. J. Trop. Med.*, vi, no. 1, pp. 3-9, 11 refs. Moscow, 1928. (With a Summary in French, p. 69.)

Though outbreaks of sandfly fever occurred near Tiflis in 1925 and 1926, this disease is not regular in its incidence each year, epidemics being occasional. An unidentified species of *Phlebotomus* was observed in large numbers; the sandflies occur from the second half of June to the end of August or beginning of September.

[OGANOV (L. I.).] Оганов (Л. И.). **Malaria and its Control in the Skopinsk District.** [In Russian.]—*Russ. J. Trop. Med.*, vi, no. 1, pp. 15-32. Moscow, 1928. (With a Summary in French, p. 69.)

The topography of the country and the conditions of life in this District of the Ryazansk Government are described. The malaria problem has been under consideration since 1923, and the results of systematic clinical inspections are discussed.

The Anophelines occurring in the district are *Anopheles maculipennis*, Mg., and *A. bifurcatus*, L., the former being the more abundant. As a result of oiling operations under natural conditions and laboratory experiments, it was found that kerosene does not only have a mechanical action on mosquito larvae, producing asphyxiation, but also a chemical one. In some cases, therefore, positive results were obtained although the oil film did not completely cover the water surface, as part of the kerosene dissolves in the water and may possibly alter the active reaction of the medium, and provided that the larvae come in contact with the oil film for even 10-15 minutes, the effect is fatal though they are in clean water. Oiling need not be begun until fourth instar larvae are present and need only be repeated about every 25 days; under laboratory conditions the period between oviposition and the emergence of the adult was never less than 30 days.

During 1927 first stage larvae of *Anopheles maculipennis* were found in nature in the middle of May, so that the eggs were probably laid by the overwintering adults between the 5th and 10th of the month. The first adult Anophelines emerged on 11th June, this slight retardation in development being probably due to low temperature conditions during the first three weeks of May. The second mass oviposition presumably occurred about 7th-15th July; the periodicity could not be further studied owing to the overlapping of the stages.

[SMIRNOVA (E. V.) & SIMANIN (P. I.).] Смирнова (Е. В.) и Симанин (П. И.). **The Question of the Relation between the Number of Gametes in the Blood of a Malaria Patient and the number of Oocysts in the Stomach of *Anopheles*.** [In Russian.]—*Russ. J. Trop. Med.*, vi, no. 1, pp. 38-46, 4 refs. Moscow, 1928. (With a Summary in French, pp. 69-70.)

The results of these observations have shown that the number of female gametocytes of *Plasmodium falciparum* (*praecox*) in the blood of a malaria patient is approximately equal to, or considerably greater than, the number of male ones. The number of oocysts in the stomach of the mosquito is not directly proportional, but is considerably lower

than the number of female gametocytes in the blood of the patient. A 50 per cent. infection of *Anopheles maculipennis*, Mg., can only be obtained when the blood of the patient contains at least 150–200 gametocytes to the cubic millimetre.

[SHINGAREV (N. I.).] Шингарев (Н. И.). **Notes on Culicidae, iii.** [In Russian.]—*Russ. J. Trop. Med.*, vi, no. 1, pp. 47–53, 1 pl. Moscow, 1928. (With a Summary in English, p. 71.)

Among the new mosquitos described are *Anopheles relictus* from Uzbekistan; *A. alexandrae schingarevi* from the Vladimir and Penza Governments; *A. intermedius* from Moscow; and *A. popovi* from Turkestan. *A. (Myzomyia) turkhudi* var. *persicus*, Edw., from Samarkand is recorded for the first time from U.S.S.R.

[MARTZINOVSKIĬ (V. I.).] Марциновский (В. И.). **Observations on Hibernating Mosquitos.** (Moscow 1926–1927.) [In Russian.]—*Russ. J. Trop. Med.*, vi, no. 2, pp. 121–123. Moscow, 1928. (With a Summary in French, p. 143.)

The following is taken from the author's summary: *Anopheles [maculipennis, Mg.]* will revive after exposure to -32°C . [$-25\cdot6^{\circ}\text{F}$.], whereas a temperature of -15°C . [$+5^{\circ}\text{F}$.] is fatal to *Culex*.

[SIMANIN (P. I.).] Симанин (П. И.). **Experimental Infection of *Anopheles maculipennis*, Mg., with the *Plasmodium* of Malaria from a Patient treated with Quinine.** [In Russian.]—*Rev. Microbiol. Epidémiol. Parasit.*, vii, pt. 2, pp. 149–155, 8 refs. Saratov, 1928. (With a Summary in English, pp. 225–226.)

Different views are held as to the possibility of the infection of mosquitos fed on the blood of malaria patients who have been treated for a certain period with quinine. The present work comprises experiments made with 14 malaria patients who had been taking quinine for varying lengths of time. Oocysts and sporozoites were found in 9 out of 11 mosquitos (*Anopheles maculipennis*, Mg.) fed on two patients carrying gametocytes of *Plasmodium vivax* who had taken 1·8 gr. of quinine. In experiments with *P. falciparum* (*praecox*) one patient had taken 22·8 gr. and another 25·2 gr. of quinine, in spite of which some mosquitos fed on them contained sporozoites in the salivary glands. Of the total of 87 mosquitos fed on blood containing gametocytes of *P. falciparum*, 50 showed oocysts and sporozoites upon dissection.

[BLAGOVESHCHENSKIĬ (D. I.).] Благовещенский (Д. И.). **Paris Green as a Larvicide in the Control of Malaria Mosquitos.** [In Russian.]—*Rev. Microbiol. Epidémiol. Parasit.*, vii, pt. 2, pp. 156–167, 9 figs., 33 refs. Saratov, 1928. (With a Summary in German, pp. 226–227.)

The literature on the use of Paris green against mosquito larvae is reviewed at some length. The experiments described were made in the laboratory, using river water containing water-plants. Paris green, mixed in varying proportions with either road dust or powdered clay,

was dusted on the surface of the water through a muslin sieve at the rate of about 1 lb. of the mixture to 100 sq. ft. of surface. The road dust remained on the surface up to the 7th day, sinking very gradually, whereas the clay only remained to the 4th day. Both mixtures killed all Anopheline larvae, irrespective of their age. The period required to kill the larvae does not only depend on the concentration of the poison (those tried were 1 : 25, 1 : 50, 1 : 100, and 1 : 200), but also on the temperature of the water. In warmer water the larvae are more active and come to the surface more frequently, thus ingesting more of the poison; in colder water they may remain at the bottom of the water for 25 minutes. The shortest period after which death ensued was 2 hrs. 20 mins., the temperature of the water being 22° C. [71.6° F.], and the longest period was 22 hrs. in water with a temperature of 12° C. [53.6° F.]. In both cases the concentration used was 1 : 100. Death occurs when the poison reaches the digestive tract. A few larvae of *Culex* succumbed, probably as a result of swallowing poison that had settled at the bottom of the water. Road dust alone killed a small number of the larvae, apparently by blocking the digestive tract. None of the concentrations tested had any effect on the pupae of *Anopheles* or *Culex*. Experiments with the different samples of Paris green showed that the variation in the content of arsenic and water-soluble arsenic did not materially accelerate or retard the death of Anopheline larvae.

PARROT (L.). **Sur quelques phlébotomes de la Bokhara.**—*Rev. Microbiol. Epidémiol. Parasit.*, vii, pt. 2, pp. 230-234, 5 figs., 4 refs. Saratov, 1928. (Also in Russian, translated by E. N. Pavlovskii, pp. 183-189.)

As a result of a study of a number of sandflies received from Bokhara, the author discusses the antennal variation of *Phlebotomus sergenti*, Parr., in Algeria and Bokhara, from which he concludes that *P. caucasicus*, Marz., is a synonym [*R.A.E.*, B, ix, 43], and *P. li*, Popov, a variety, of this species.

The collection also included two new varieties, one of *P. minutus*, Rond., and one of *P. major*, Annan.

[OLENEV (N. O.).] **Оленев (Н. О.). Biological Observations on the Persian Tick (*Argas persicus persicus*, F.-W.).** [*In Russian.*]—*Défense des Plantes*, v, no. 1, pp. 5-14, 5 figs., 5 refs. Leningrad, 1928.

As a result of information collected from a survey of fowl houses in and near Saratov, as well as from laboratory observations, it is evident that the generations of *Argas persicus*, Öken, overlap considerably. As a rule development only takes place at temperatures above 20° C. [68° F.] and continues for 134-220 days, resulting in one generation a year. Owing, however, to the ability of the various stages to withstand starvation for long periods, a single generation may extend over several years. The larvae spend 4-6 days feeding on the host, but apart from this short period the ticks pass their entire life in the cracks and crevices of fowl houses or other places where the birds roost, only attacking the latter at night. Their presence may be detected by the empty skins caught in spiders' webs and the excreta found in the cracks.

[ПОПОВ (V.).] Попов (B.). **Contribution to the Knowledge of the Biology of the Tick, *Dermacentor niveus*, Neum., in the Amur District of the Far East Region.** [In Russian.]—*Défense des Plantes*, v, no. 1, pp. 15–18, 3 refs. Leningrad, 1928.

In Amur *Dermacentor niveus*, Neum., appears when the snow melts about the middle of April. Ticks that have hibernated occur in large numbers up to the end of May, and isolated individuals are found even at the end of June. The abundance of tall-stemmed grasses and the comparatively dry conditions of the spring in Amur favour the distribution of this tick. It attacks all kinds of domestic animals, including horses, cattle, sheep and dogs, and occasionally even man. Any part of the skin that is not too thick may be attacked. The ticks are most active during the day, ovipositing directly in the soil. The time of the appearance of the larvae and nymphs could not be ascertained. In one locality larvae and nymphs were found on various small rodents. They feed exclusively on the inner side of the shell of the ear, though under laboratory conditions when fed on rabbits they preferred to attach themselves to the eyelids. Under laboratory conditions the eggs hatch in 5–10 days. The time required for the metamorphosis from larva to nymph was 6–7 days and from nymph to adult 16–20 days. The duration of feeding could not be accurately ascertained, but is approximately 2–3 days in the case of the larva and 6–7 in the case of the nymphs.

Other ticks recorded from Amur are *Haemaphysalis concinna kochi*, Neum., found occasionally on dogs, and *Ixodes ricinus*, L., on sheep and dogs.

EDWARDS (F. W.) & GIVEN (D. H. C.). **The Early Stages of some Singapore Mosquitos.**—*Bull. Ent. Res.*, xviii, pt. 4, pp. 337–357, 9 figs. London, May 1928.

Descriptions are given of the larvae and in some cases of the pupae of 25 additional species of Culicines reared in 1925–27 in Singapore [cf. *R.A.E.*, B, xiv, 217]. A key is also given to the larvae of the three subgenera of *Taeniorhynchus*. In the course of a study of the mosquito fauna of pitcher-plants, one undetermined species of *Anopheles* was found.

HAMLIN-HARRIS (R.). **The Relation of certain Algae to Breeding Places of Mosquitos in Queensland.**—*Bull. Ent. Res.*, xviii, pt. 4, pp. 377–389, 14 refs. London, May 1928.

An attempt has been made to determine the motives for the selection of certain breeding-places by mosquitos and the avoidance of others in Queensland. Observations indicate that for Anophelines at least the presence of larval food is the determining factor. It has now been proved fairly conclusively that certain algae that have been thought to have an inhibiting effect on the growth of mosquito larvae are really negligible in this respect. On several occasions larvae of *Anopheles annulipes*, Wlk. (which are very frequently found where algae are present) were placed in jars containing species of *Nitella* or *Chara benthami*, but none of them failed to mature, and they evidently feed

and thrive on algal growth. It is thought, however, that such plants may be useful indicators of the types of water in which they grow, and it is suggested that a study of the soils underlying natural waters that are avoided as breeding-places may throw much light on the problem of selection. Natural soil solutions are constantly varying in composition with changes of temperature, the addition of oxygen and carbon dioxide through rain, etc., and the absence or presence of mosquito larvae may depend on the supply of larval food at any period. The presence of large quantities of iron salts in solution is another factor to be considered; that much iron is present is evident from the ferric salts that are deposited in large quantities in a slimy flocculent mass on certain plants and in particular on *Chara* and *Nitella*. Such waters are mostly acid in tendency and range from pH 6.4 to 7; Culicine larvae are seldom found in natural waters of this type. It is suggested that the salts of alumina and iron in the ferrous state tend to destroy food organisms. The effect of infusions of decaying algae on mosquito larvae was tried, and only in one instance, where *Cladophora* was the alga used, did the infusion show any sign of inhibiting larval growth. Though larvae of *Culex fatigans*, Wied., lived for 14 days in this infusion and may have died of starvation, they made no attempt to pupate, while *Aedes argenteus*, Poir., died immediately after pupation. It is hoped to conduct further tests of this nature. In laboratory studies of the pH value of various waters of different acidity, it was observed that when the water stood for some time the acidity slowly disappeared in every case, a considerable state of alkalinity sometimes being reached. The scums that form on standing water in the laboratory are mainly bacterial, and these bacteria have a tendency to produce slight alkalinity. Mosquito larvae in such water frequently exhibit signs of discomfort by making unusual movements.

WILLIAMSON (K. B.). **Mosquito Breeding and Malaria in Relation to the Nitrogen Cycle.**—*Bull. Ent. Res.*, xviii, pt. 4, pp. 433–439, 17 refs. London, May 1928.

It appears that neither purely physical characteristics nor associated examples of the larger aquatic vegetation will serve as discriminants of water that is suitable for particular species of aquatic organisms. Both algae visible to the naked eye and micro-organisms may prove to be discriminants; records of associations of mosquito larvae, positive or negative, with algae, are scanty, and practically nothing is known of the microfauna and microflora of mosquito-breeding waters. Such positive correlations as have been observed between the occurrence of mosquito larvae and particular algae cannot be accepted as invariable unless proved over a wide area, embracing different types of water; negative associations appear to hold good, an example in Malaya being the general absence of Anopheline larvae from water containing *Microcystis*. This blue-green alga, which forms a dense scum, only occurs in foul water, and this probably accounts for the absence of Anopheline larvae.

These considerations suggest the possibility that the chemical characteristics of water may be among the ultimate determinants of mosquito breeding. The duration and intensity of radiation falling upon the water surface are fundamentally important, since they determine the total of available food produced by photosynthetic

activity, as well as the temperature of the water, which may approach to within a few degrees of the thermal death point of exposed breeders, even in the mild heat of Malaya. There is increasing evidence that the circumstances under which proteins are decomposed and the intermediate products of their transformation, modified by more or less complete oxidation, are important for aquatic animals. That they may also be important for Anopheline larvae is suggested by observations in Malaya. A table is given showing the relation of the predominance of *Anopheles maculatus*, Theo., or *A. kochi*, Dön., to certain organic and organically derived factors, obtained from analysis of the water, the data being based on weekly collections on a rubber estate where these two species were associated. *A. maculatus*, while possessing great adaptability, typically breeds in very pure water, but *A. kochi* breeds in stagnant, sometimes contaminated water. Larvae of *A. maculatus* were most, and those of *A. kochi* least, abundant when the albuminoid content of the water was least. The fact that response to the changing composition of the water was recurrent and rapid justified the conclusion that the latter had a direct effect upon the survival of larvae. The figures in the table for albuminoid nitrogen, oxygen and the ratio of oxidised to ammoniacal nitrogen strongly suggest that the condition unfavourable to *A. maculatus* was defective oxidation in presence of excess of albuminoid matter. Since similar facts have been observed in the case of other associated Anopheline larvae, it is not improbable that changes occurring in the katabolic arc of the nitrogen cycle, in relation to the more or less complete oxidation of proteins and their derivatives, are an important, if not the chief chemical cause determining the suitability of water for Anopheline larvae as a whole, as well as that of particular types of water for those of particular species.

The chemical factors outlined above probably operate largely through determining the quality of the food, especially when this consists, as is the case with mosquito larvae, partly of detritus. For the latter's content both of bacteria and of nitrogenous derivatives is respectively modified or determined by antecedent occurrences in the nitrogen cycle, controlled among other things chiefly by oxidation and by chemical activities of the bacteria themselves.

Much further investigation in Malaya and in other countries in which conditions differ materially is needed before general conclusions can be established, but the author considers that certain facts may be accepted. The importance of efficient oxidation of the products of protein-lysis is shown by the fact, established by Harvey, that putrefactive changes in peptone generate a filter-passing poison, effective in the absence of the bacteria that attended its origin. The discriminative value of the ratio between oxidised and ammoniacal nitrogen, which is perhaps new to hydrobiology and may appropriately be termed the "nitrification ratio," has been found to be fairly wide in the case of other associated Anopheline larvae, although it sometimes fails; it may be explained by the fact that oxidation of ammonia proceeds concurrently with profounder oxidations of proteins and their more complex derivatives. The nitrification ratio cannot be expected to serve except in shallow water, for algae deplete the surface layers of deep waters of nitrates in summer. The ratio of nitrates to albuminoid matter and the concentration of ammonia present also possess discriminative value. Dissolved oxygen possesses discriminative value, not so much because it provides one essential for oxidation as because it is an index of the pre-existing balance between the demand

for, and the supply of, oxygen. Hydrogen-ion concentration would not in itself appear to affect Anopheline larvae appreciably and directly within its ordinarily occurring range of variation; the occurrence of the maximum abundance of a species at the extremes of hydrogen-ion concentration at which it is observed precludes the possibility that these are limiting values, or even very near them.

The author concludes by referring to the effect of rotting fish and reeds in preventing mosquito breeding, and to the fact that many if not most of the efficient vectors of malaria breed in pure water [*R.A.E.*, B, xvi, 69]. He suggests that it may possibly be significant that other Protozoa that infest mammalian blood complete their cycle of development only in such otherwise unrelated Arthropods as have an entirely aerial trophic existence, uncontaminated by a larval environment corrupted by bacterially rotted and infected food.

HOFFMAN (W. A.). **A Container for Field Collection of Mosquito Larvae.**—*Science*, lxvi, no. 1716, p. 484. New York, 18th November 1927. (Abstract in *Publ. Hlth. Rep.*, xliii, no. 20, pp. 1216–1217. Washington, D.C., 18th May 1928.)

This container, with which fairly satisfactory results are stated to have been obtained over a period of four months, consists of a 4 oz. jar with a rubber stopper through which pass two glass tubes, one being funnel-shaped at the end for the reception of the mosquito larvae. A metal clamp, one end of which hooks over the carrier's belt, is fitted tightly to the neck of the jar by means of a tension spring.

A note by the abstractor, L. M. Fisher, states that in many instances larvae were drowned in containers somewhat similar to the one described when carried on the person during collecting trips, but that better results were obtained by carrying larvae on moistened blotting-paper, etc., in a suitable container permitting a certain amount of evaporation to keep them cool.

MYERS (G. S.). **The Species of *Piabucina* inhabiting Colombia.**—*Copeia*, no. 166, pp. 4–5. New York, March 1928.

The fish recorded as an enemy of mosquito larvae in Colombia under the name of *Piabucina panamensis* [*R.A.E.*, B, xiii, 90] is not that species but *P. festae*, which is common in the Atrato and San Juan basins of the Pacific Slope.

LEGENDRE (J.). **Poissons culicivores—leur emploi.**—*Rev. Hist. nat. appl.*, (1) ix, no. 5, pp. 138–140. Paris, May 1928.

This is a popular account of the use of fish against mosquito larvae, the author pointing out that there are many cases in which this method is effective. Mosquito larvae in water-butts and ponds in gardens are destroyed by gold-fish, and larvivorous fish can also be used in wells that provide water for animals, although they should not be placed in wells that provide water for human consumption. The author found an eel to be ineffective in destroying Culicine larvae in a well. Fish are also valuable for preventing mosquito breeding in pools left in the beds of rivers that dry up in the summer; in such cases fishing in these pools should be prohibited, and fish should be introduced if not already present.

TRABUT (L.). **Rôle des poissons dans la lutte contre le paludisme.**—*Bull. agric. Algérie-Tunisie-Maroc*, xxxiv, no. 4, pp. 61–63, 2 figs., 1 ref. Algiers, April 1928.

Several small species of fish that feed on mosquito larvae and are able to live in ditches and pools containing small quantities of water occur in Algeria, the most valuable in this respect being *Tellia apoda*, *Cyprinodon fasciatus* and *C. iberus*. The author considers that the last-named, which occurs in southern Oran, would be the most useful to introduce into the marshes of the Tell; he cites an instance that came under his observation thirty years ago, in which a garrison near a swamp in which *C. iberus* was abundant remained in good health, while in a neighbouring garrison near a swamp in which this fish did not occur malaria was severe. The results of the introduction of *Gambusia holbrooki* into Corsica [*R.A.E.*, B, xvi, 112] are quoted; this fish has recently been introduced into Algiers.

SENEVET (G.) & PRUNNELLE (M.). **Larves de Culicides recueillies en Algérie et en Tunisie par M. H. Gauthier.**—*Bull. Soc. Hist. nat. Afr. N.*, xix, no. 2, pp. 94–99. Algiers, 15th February 1928.

A list is given of 12 species of mosquito larvae, including *Anopheles maculipennis*, Mg., and *A. (Myzomyia) hispaniola*, Theo., collected from fresh water in Algeria and Tunisia, with notes on their distribution.

DAVIS (N. C.) & SHANNON (R. C.). **The Habits of *Anopheles rondoni* in the Argentine Republic.**—*Amer. J. Hyg.*, viii, no. 3, pp. 448–456, 2 figs., 4 refs. Baltimore, Md., May 1928.

Anopheles rondoni, Neiva & Pinto, which was described from Matto Grosso, Brazil, has been found in the province of Jujuy, northern Argentina. In one locality, in a shallow ditch with grassy edges containing fairly clear water, in which a certain amount of detritus was present but no visible algae, about 98 per cent. of the Anopheline larvae were *A. rondoni*. In an adjacent swamp containing an abundance of green algae, a few larvae of this species occurred, but *A. pseudopunctipennis*, Theo., greatly predominated. Pupation and emergence of *A. rondoni* occurred during August, so that breeding does not stop during the winter; the height of the breeding season is in late summer, probably in March. The main flight of the adults occurs slightly earlier in the evening than with *A. pseudopunctipennis*. *A. rondoni* is not a domestic species to the same extent as *A. pseudopunctipennis*, but it is found in houses in appreciable numbers. The stomachs of 84 and the glands of 88 specimens captured in March 1927 were examined for malaria parasites with negative results; parasites were found in the stomachs of 8 out of 369 specimens of *A. pseudopunctipennis* examined at the same time. Attempts to infect *A. rondoni* by allowing it to feed on malaria patients were unsuccessful. Three out of eight females of *A. pseudopunctipennis* that fed at the same time as those of *A. rondoni* on a patient who had taken quinine 24 hours previously were found to contain cysts of *Plasmodium falciparum* 11 days later; no cysts were found after 8 days in six females of *A. pseudopunctipennis* that had fed on patients infected with *P. vivax* who had taken quinine.

Mosquitos bred from eggs laid by captured females of *A. rondoni* were always similar to the mothers; the same was true in the case of *A. tarsimaculatus*, Goeldi, from the same locality, although only 14 adults

of the latter were reared as against 111 of the former. These results provide additional evidence that *A. rondoni* is not a variety of *A. tarsimaculatus*. Adults of *A. rondoni* emerged 26-35 days after the eggs were laid, in March and April. Some captured individuals were kept alive for more than a month in captivity, receiving occasional blood meals.

DAVIS (N. C.). **A Study on the Transmission of *Filaria* in Northern Argentina.**—*Amer. J. Hyg.*, viii, no. 3, pp. 457-466, 3 figs., 8 refs. Baltimore, Md., May 1928.

This paper records the results of feeding *Cimex lectularius*, L., *Triatoma infestans*, Kl., and mosquitos on a man infected with filarial larvae in northern Argentina. The identity of the microfilariae is discussed; they have been described as *Filaria* (*Microfilaria*) *tucumana*, but are probably identical with *F. (M.) ozzardi*. Infection is commonest among the poorer people living in wooded areas near streams in hilly country. It is not known to be pathogenic.

In the author's experiments, microfilariae were found in the mid-gut of nymphs of *T. infestans* and in both the mid-gut and hind-gut of *C. lectularius*, and showed slight motion as late as the fourteenth day after ingestion, but no development took place. Dissections were made of the thorax, head and mouth-parts of 117 mosquitos from 2 to 22 days after feeding. Of 41 specimens of *Aedes argenteus*, Poir. (*aegypti*, L.), only one was infected, on the seventh day, and the single Nematode present was either dead or retarded in development. Two out of 17 individuals of *Anopheles tarsimaculatus*, Goeldi, were infected, one Nematode being found on the twelfth day and two on the seventeenth. One out of 12 individuals of *A. albitarsis*, Arrib., was infected, three Nematodes being found on the twelfth day. Notes are given on the morphology of the microfilariae in each mosquito. Neither *A. tarsimaculatus* nor *A. albitarsis* is domestic, although both are occasionally found in houses and will take human blood. No infections were found in 12 individuals of *A. argyritarsis*, R.-D., 18 of *A. pseudopunctipennis*, Theo., and 17 of *Culex fatigans*, Wied. (*quinquefasciatus*, Say); the last two species and *Aedes argenteus* are the most highly domesticated mosquitos in northern Argentina. It is thought that *Anopheles tarsimaculatus* and possibly *A. albitarsis* may be the vectors of the Nematode, although other insects, particularly *Simulium*, should be investigated.

DAVIS (N. C.). **Notes on the Development of Ovarian Follicles in Argentine *Anopheles*.**—*Amer. J. Hyg.*, viii, no. 3, pp. 467-475, 1 ref. Baltimore, Md., May 1928.

The author's summary of this paper is as follows: The data herein set forth indicate that it is not the rule for *Anopheles pseudopunctipennis*, Theo., to develop mature ovarian follicles after a single blood meal. It is suggested that the physiological need for more than one engorgement may account in part for the domesticity of this species in northern Argentina. During warm weather, the members of the *Nyssorhynchus* group [e.g., *A. argyritarsis*, R.-D.] appear capable of maturing their ova after one satisfactory blood meal. Anophelines fed on fruit only show the storage of a small amount of yolk in their ovarian follicles, and such ova do not develop beyond stage 2 (of Christophers). Warmth has a markedly stimulating effect on early follicular development. The largest eggs of *A. pseudopunctipennis* barely reach the

minimum size usually accepted for Anopheline eggs, namely, 0.6 mm. The ova of the *Nyssorhynchus* group [*A. albitarsis*, Arrib., *A. argyritarsis*, etc.] are considerably smaller. Measurements of mature ovarian follicles and of eggs already laid indicate that in *Anopheles* there is an increase of 15 to 20 per cent. in length of egg following oviposition.

PAPERS NOTICED BY TITLE ONLY.

- HENDERSON (J. R.). **A Note on some external Characters of Larvae of *Xenopsylla cheopis*.**—*Parasitology*, xx, no. 1, pp. 115–118, 4 figs., 1 ref. Cambridge, April 1928.
- INGRAM (A.). **Three new South African *Xenopsylla* (Siphonapt.).**—*Bull. Ent. Res.*, xviii, pt. 4, pp. 371–375, 7 figs. London, May 1928.
- BEATTIE (M. V. F.). **Observations on the Thermal Death Points of the Blow-fly [*Calliphora erythrocephala*, Mg.] at Different Relative Humidities.**—*Bull. Ent. Res.*, xviii, pt. 4, pp. 397–403, 2 figs., 5 refs. London, May 1928.
- [BOGDANOV (E. A.).] БОГДАНОВ (Е. А.). **The Value of Experiments with the Common Bluebottle Fly [*Calliphora erythrocephala*, Mg.] in determining the Question of Inheritance of acquired Characters.** [*In Russian.*].—8vo, 68 pp., 9 figs., numerous refs. Moscow, Gosud. Timiryazevsk. Nauchno-Issled. Inst., 1928. Price 95k.
- [PERFIL'EV (P.).] PERFILJEV (P.). **Beiträge zur Anatomie der *Phlebotomus*-Larven.** [Contributions on the Anatomy of the Larvae of *Phlebotomus*.]—*Centralbl. Bakt.*, (1) Orig., cvii, no. 4–5, pp. 296–305, 11 figs., 8 refs. Jena, 14th May 1928.
- ZERNOFF (V.). **L'immunité passive chez *Galleria mellonella*.**—*C.R. Soc. Biol.*, xcvi, no. 36, pp. 1697–1699, 1 ref. Paris, 4th January 1928. **Sur la spécificité de l'immunité passive chez *Galleria mellonella*.**—*Op. cit.*, xcvi, no. 17, pp. 1500–1502, 1 ref. 25th May 1928.
- BOREL (M.). **Note sur la présence d'*Argas vespertilionis* (Latreille) 1796 au Cambodge.**—*Bull. Soc. Path. exot.*, xxi, no. 4, p. 328. Paris, 1928.
- Bibliographical Index of Russian Works on Malaria, 1914–1921.** [RASHINA (M. G.).] РАШИНА (М. Г.). **Supplement to the Bibliographical Index of Russian Works on Malaria : 1922–1926.** [*In Russian.*].—*Russ. J. Trop. Med.*, vi, no. 1, pp. 63, 64–65. Moscow, 1928. [*Cf. R.A.E.*, B, xiv, 79.]
- [SEBENTZOV (B. M.) & ADOVA (A. N.).] СЕБЕНЦОВ (Б. М.) и АДОВА (А. Н.). **Reports on Studies in 1925 and 1926 of the Conditions regulating the Presence of Larvae of *Anopheles maculipennis* in Turf pits.** [*In Russian.*].—*Russ. J. Trop. Med.*, vi, pp. 54–57, 89–105 (with a Summary in French), 24 refs. Moscow, 1928. [*Cf. R.A.E.*, B, xiv, 201 ; xv, 188 ; xvi, 96, etc.]
- [SHCHELKANOVITZEV (Ya. P.).] ЩЕЛКАНОВЦЕВ (Я. П.). **On Some Species of Mosquitos of the Genus *Aedes*, Mg., from the Environs of the Town of Voronezh.** [*In Russian.*].—*Bull. Soc. Naturalistes Voronège*, ii, fasc. 2, pp. 57–71, 8 figs., 3 refs. Voronezh, 1928. (With a Summary in German.)
- MEDSCHID (—). **Ueber *Aedes lepidonotus* Edw. [Larva described] und *Aedes refiki* n. sp. [both from Asia Minor].**—*Arch. Schiffs- u. Tropenhyg.*, xxxii, no. 6, pp. 306–315, 8 figs. Leipzig, June 1928.

Report of Bureau of Malaria Control 1926-27. Paper IV.—Porto Rico Rev. Publ. Hlth. Trop. Med., iii, no. 9, pp. 376-385. San Juan, P.R., March 1928.

An account is given of experiments to determine the feeding habits of *Anopheles albimanus*, Wied., and *A. grabhami*, Theo., in Porto Rico, by means of the precipitin test of the blood in mosquitos captured in a house occupied at night by men and various domestic animals. In most cases the men were nearer the place at which the mosquitos entered the house than the animals, and in some cases the animals were partly protected from attack by a screen. Combining the results of a number of experiments, the percentages of bites on man were 29 for *A. albimanus* and 11 for *A. grabhami* when horses were present, 20 and 14 when oxen were present, 19 and 9 when horses and oxen were present, and with a small total number of bites, 48 and 7 when pigs were present. In most of the catches *A. grabhami* predominated. In further experiments men were placed in the house alone, with or without animals outside the entrance; on an average, the number of mosquitos that entered the house when horses were outside was less than one-third of the number that entered when there were no animals outside, and with oxen the number was still smaller; very few individuals of *A. grabhami* entered the house in search of human blood even when there were no animals outside.

These experiments show the marked difference in the attractiveness of man for *A. albimanus* and *A. grabhami*, and confirm previous observations to the effect that the latter greatly prefers animals, especially horses and cattle, to man, and does not enter houses much in search of human blood. It is considered probable that very few individuals of *A. albimanus* enter houses at night if there are horses and cattle between the houses and the breeding-places of the mosquitos, although the protection is not nearly so great if the animals are on the far side of the house from the breeding-places. The large numbers of cattle and horses in Porto Rico probably aid considerably in preventing outbreaks of malaria, although the amount of protection may vary, as there are few stables and the animals are mostly in the pastures at night.

SCHULE (P. A.). **Dengue Fever: Transmission by *Aedes aegypti*.**—*Amer. J. Trop. Med.*, viii, no. 3, pp. 203-213, 4 refs. Baltimore, Md., May 1928.

This is an account of experiments carried out in the Philippines to determine the length of time that must elapse before a female of *Aedes argenteus*, Poir. (*aegypti*, L.) that has bitten a patient infected with dengue can transmit the disease. The following is largely taken from the author's summary: Seven men proved to be susceptible to dengue fever were bitten by *A. argenteus* at varying intervals of time after the mosquitos had fed on a known experimental case on the first day of the disease. Dengue was not transmitted by interrupted feeding, nor was it transmitted when the interval between the infective feed and the subsequent biting was two, three, four or six days, but it was transmitted when the interval was eight days, ten days, or more.

CURRY (D. P.). **A new Anopheline Mosquito, *Anopheles (Chagasia) bathanus*, Dyar, discovered in the Canal Zone.**—*Amer. J. Trop. Med.*, viii, no. 3, pp. 243-248, 3 refs. Baltimore, Md., May 1928.

Dyar's description of *Anopheles (Chagasia) bathanus* [*R.A.E.*, B, xvi, 167] is reproduced, and notes are given on the distinguishing characters of the larva, pupa and adult and on the habits of the larva. The breeding-places of this mosquito in the Panama Canal Zone, where it occurs in swift streams in hills on the Atlantic side, very closely resemble those of *A. (C.) fajardoi*, Lutz, in Brazil [*R.A.E.*, B, xv, 228]. The adults have not so far been taken on the wing or in houses.

ROUBAUD (E.). **Nouvelles recherches sur l'évolution zoophile des faunes d'anophèles en Europe (*A. maculipennis*) d'après les données de l'armement maxillaire.**—*Ann. Inst. Pasteur*, xlii, no. 5, pp. 553-618, 16 figs., 38 refs. Paris, May 1928.

In this paper the author discusses at length his theory of the origin of zootropism and zootropic races in *Anopheles maculipennis*, Mg., in Europe, collating his previously published work on the subject [*R.A.E.*, B, viii, 141; x, 53, 101; etc.] and the results of further investigations. Very briefly, the theory is that regulation and stabilisation of the waters in which *A. maculipennis* breeds, together with permanent housing of domestic animals in buildings in which the adult mosquitos normally shelter, stabilise its conditions of life; that it acquires, by natural selection, a maxillary armature more and more adapted to feeding on animals; and that the degree of zootropism is indicated by the maxillary index.

Where the mosquitos have no preference for domestic animals, the maxillary index (average number of teeth on each maxilla) is generally below 14, and they are dangerous from the point of view of malaria; where the preference for domestic animals is marked, the maxillary index is above 14. This has been borne out by the study of a large number of specimens from various regions. When the competition between mosquitos for animal hosts is slight, the maxillary index is not above 15, but when competition is very great, it rises to 17 or above. An excessively high index indicates a shortage of animal hosts, when man may again be attacked. The periods during which *A. maculipennis* attacks animals are a few hours during the evening and a short time in the early morning. When the animals are attacked by large numbers of mosquitos, they become very restive, and it is much more difficult for a female to obtain its blood meal than when there are fewer mosquitos present. Consequently the females with maxillae that enable them to pierce the skin of the animal in the minimum of time are almost the only ones that succeed when competition is intense. If the females with less well-armed maxillae succeed in obtaining sufficient nourishment to enable them to oviposit, then the larvae that hatch from their eggs are stragglers, and will develop with difficulty because the water is already occupied by the older larvae produced by the females with stronger maxillae [*R.A.E.*, B, xi, 162]. It is in this way that natural selection raises the maxillary index of a dense population of *A. maculipennis* to a point that tends to represent the adaptation best suited to its needs in relation to a particular species of animal. Examination of females captured in the vicinity of different animals in the same districts has shown that there is a tendency for a single

type of maxillary armature to predominate where the thickness of the skin of the hosts attacked is uniform, while several types occur where there is a variety of hosts.

The conditions of the waters of a locality affect the development of the maxillary index more or less directly, water surface being the important factor with regard to competition, since it controls larval development. Where the conditions of the water in which mosquito breeding takes place are unstable, the maxillary index is variable; where they are stabilised, the maxillary index is stable. These facts are illustrated by observations in two parts of la Vendée and in other parts of Europe. In the great marsh area of la Vendée, there is a regular drainage system and the water surface in the dykes remains practically unaltered throughout the season, and from season to season; consequently the density of the Anopheline population, which is very great, varies little from year to year, and its zootropism is remarkably constant, as is also the maxillary index. There is a balance between the conditions of larval development, the supply of animal blood, and the ability of the females to acquire adequate nourishment, which the author calls the "zootropic equilibrium," the effect of which is to afford the maximum protection of man from attack by the mosquitos. This race of *A. maculipennis* is considered to be a stable zootropic one. On the coast of la Vendée, outside the great marsh area, but not more than $2\frac{1}{2}$ miles from it, a race of *A. maculipennis* occurs that breeds in small pools of fresh water, ditches, etc., which are essentially unstable in character, although more or less permanent. This race has a high average maxillary index (16.6) with a wide range of individual variation, but attacks man freely as well as animals, the latter being fewer and more scattered than in the marsh area. In 50 first generation descendants of a female of this race with 18 teeth on each maxilla, the number of maxillary teeth varied from 14 to 18, with an average of 15.7. This race is considered to be an unstable zootropic one.

Breeding experiments with females of *A. maculipennis* from the marsh area of la Vendée showed that the number of maxillary teeth in these is fixed hereditarily to a striking degree, the maxillary indices agreeing closely with those of the mothers in both the first and second generations; in the third generation, individuals of which were weak, owing to the difficulty of continued laboratory breeding, the index was lower. Neither the temperature nor the salinity of the water in which the larvae were reared affected the maxillary index so long as they were compatible with proper development.

The author considers that the regression of malaria in parts of Europe following drainage works and the general improvement of rural conditions has been due much more to their stabilising effect on *A. maculipennis* by regulation of breeding places and the provision of a regular and adequate supply of animals on which the adults can feed, than to the improvement of the conditions of human life.

BOREL (M.). *Enquête malariologique à la station d'essai de Giaray (Cochinchine)*.—*Bull. Soc. Path. exot.*, xxi, no. 4, pp. 312-314. Paris, 1928.

At the Agricultural Experiment Station of Giaray, in eastern Cochin China, malaria is severe, causing a loss of 15-20 per cent. in the working days of the native staff. The Station is situated at the foot of a wooded

mountain, partly on red soil and partly on grey soil, the former only being cultivated, while within about 600 yards of the habitations there are streams in which the author found larvae of *Anopheles barbirostris*, Wulp, *A. aconitus*, Dön., *A. minimus*, Theo., and *A. fuliginosus*, Giles, in that order of frequency, in December 1927. *A. maculatus*, Theo., also occurs there.

[YATZENKO (F. I.).] IATZENKO (Th. I.). **Sur la zoophilie de l'*Anopheles maculipennis* en Ukraine.**—*Bull. Soc. Path. exot.*, xxi, no. 4, pp. 322–323. Paris, 1928.

During 1925 and 1926 it was observed in many places in the Ukraine that *Anopheles maculipennis*, Mg., showed a marked preference for domestic animals and sometimes hibernated in animal quarters sheltered from cold and draughts. Factors that tend to diminish the value of domestic animals for protecting man from the bites of this mosquito and from malaria are proximity of man and beast, both during farming operations and in the arrangement of human and animal quarters under the same roof; the existence of ponds near houses; dampness and lack of daylight in houses and artificial illumination at night; partial or complete absence of domestic animals in the vicinity of breeding-places near factories, etc.; insufficient protection from weather in animal quarters; and, in general, insufficient numbers of domestic animals, as, for example, in towns in the valleys of large rivers. In order to obtain the maximum protection by the presence of animals, their numbers should be increased in malarious districts, the conditions in houses and animal quarters should be improved and the animals should be confined to the latter, and open windows should not be lit up at night.

No relation was found to exist between the number of maxillary teeth of *A. maculipennis* and its tendency to attack animals, or between the number of maxillary teeth and the size of the individual; the size of the mosquito, however, was found to be related to the length of the wings, the largest specimens occurring in the southern part of the Ukraine.

BAUVALLET (H.). **Essai de lutte antilarvaire par l'emploi de poudre larvicide, dans une zone inondée du Bas Dahomey.**—*Bull. Soc. Path. exot.*, xxi, no. 4, pp. 323–325, 2 figs. Paris, 1928.

Continued heavy rains during June and July 1925 resulted in the flooding of large areas of the town of Cotonou, on the coast of Dahomey. By the middle of June Anophelines had begun to breed in many places in the lakes formed by the flood water, the species being *Anopheles gambiae*, Giles (*costalis*, Theo.), *A. funestus*, Giles, and *A. pharoensis*, Theo. Oiling could not be carried out on account of the danger of fire, many occupied native huts being partly flooded. The larvicidal powder, Stoxal [*R.A.E.*, B, xvi, 63], was therefore employed, the first successful applications being made on 17th June; all the larvae at five marked points were found to have been killed about 36 hours later, and no more larvae were found in the treated area by 28th June, when the greater part was drained, two further applications having been made in the meantime. The total amount of Stoxal used was about 33 lb., and it was applied at the rate of about $3\frac{1}{2}$ grains to the square

yard. That the results obtained were excellent was shown by the extreme rarity of adult Anophelines and the fact that no recrudescence of malaria occurred during June and July.

BAUVALLET (H.). **Index Stegomyia et fièvre jaune.**—*Bull. Soc. Path. exot.*, xxi, no. 4, pp. 325–327. Paris, 1928.

The numbers of breeding-places of *Aedes argenteus*, Poir. (*Stegomyia fasciata*, F.) found in Cotonou, Dahomey, in each month from January 1925 to July 1927 by inspectors of the mosquito-control service are tabulated, together with the "index," which is the percentage of breeding-places to habitations, calculations being based on the assumption that there were 3,000 habitations. Breeding is most intense at the season of greatest rainfall, in May–June or June–July, when the mean temperature is 28–30° C. [82·4–86° F.]. The highest index figures were 5·1 and 4·96 per cent. in May and June 1927, when the inspections were most thorough, while the average for the 31 months was 2·02. No case of yellow fever occurred among either Europeans or natives during the entire period.

HEARLE (E.) & TWINN (C. R.). **Mosquito Control in Canada.**—*Circ. Dept. Agric. Canada*, no. 62, 4 pp., 4 figs. Ottawa, March 1928.

A brief general account is given of the bionomics and control of mosquitos in Canada. The control measures recommended are draining and filling, or oiling where these are not practicable. Barrels containing water for protection against fire should be treated with lime, at the rate of 1 lb. to each barrel. Protection from the bites of mosquitos can be obtained by screening and the use of repellents.

LEGENDRE (J.). **Défenses naturelles contre les moustiques (agroprophylaxie et pisciculture).**—*Ann. Méd. Pharm. col.*, xxvi, no. 1, pp. 42–82, 19 refs. Paris, 1928.

This is a collection of reprints of papers by the author on the value of various domestic animals in protecting man from the bites of mosquitos [*R.A.E.*, B, viii, 98 ; ix, 114 ; xi, 6 ; xiii, 26] and on the value of fish as destroyers of mosquito larvae and the methods of handling them, as well as two on other aspects of the mosquito problem [*R.A.E.*, B, i, 121 ; ix, 90].

MARCOVITCH (S.). **Studies on Toxicity of Fluorine Compounds.**—*Bull. Tennessee Agric. Expt. Sta.*, no. 139, 48 pp., 8 figs., 89 refs. Knoxville, Tenn., March 1928.

In the course of experiments to determine the toxicity of fluorine compounds, some of the results of which have been previously noticed [*R.A.E.*, B, xvi, 178], mosquito larvae were used for quantitative toxicological tests. Among organic acids, salicylic was the most toxic, oxalic, formic, benzoic and acetic, less so. Of metals, mercury proved the most toxic ; barium, lead, zinc and copper were somewhat toxic but less so than fluorine. Against *Orthopodomyia signifer*, Coq., a lethal effect was obtained with 0·02 N hydrochloric acid though none was observed with 0·02 N sodium hydroxide. Sodium fluosilicate is at least 8 times more toxic than sodium fluoride to

mosquito larvae. Two acid fluorides, chromium and antimony, were found to be more toxic than the slightly alkaline sodium fluoride. A solution of sodium fluosilicate, 1 : 10,000, is toxic to *Culex fatigans*, Wied. (*quinquefasciatus*, Say) in distilled water. Under practical conditions, in natural breeding waters heavily charged with organic matter, it required enough powder to equal 1 : 4,000 to produce a lethal effect in 2 days. Sodium fluosilicate proved much more toxic than sodium bisulphate. Crude naphthalene, when dusted on the water, destroyed *Anopheles punctipennis*, Say, within a few hours. Fluosilicates are also highly toxic to protozoa.

FREEBORN (S. B.). **Observations on the Control of Sierran *Aedes* (Culicidae: Diptera).**—*Pan-Pacific Ent.*, iv, no. 4, pp. 177–181. San Francisco, Cal., April 1928.

Aedes communis tahoensis, Dyar, *A. ventrovittis*, Dyar, and *A. hexodontus*, Dyar, are almost universal above the 5,000 ft. line in the mountains of California, hibernating in the egg stage and breeding in pools caused by melting snow. Oviposition lasts over a period of from 2 to 3 weeks, 8 to 10 eggs being laid at a time on muddy banks and similar places; *A. communis tahoensis* has been observed ovipositing in the dried-out bed of a shallow stream, which was filled with water again the following season. During the past two years, observations and attempts at control have been made at a height of 7,500 ft. in one district, where the prevailing mosquito is *A. hexodontus*. These showed that spraying the pools with fuel oil is completely effective in destroying the larvae and pupae, but that the problem of control is complicated by migration of adult mosquitos from outside the treated area. *A. communis tahoensis* was found able to migrate from breeding grounds over a mile away, the migration following the courses of streams and dense vegetation. An encouraging feature of the work was the fact that no larvae occurred in pools that had been oiled during the previous season. It is thought that the oil repelled most of the mosquitos and killed the minority that attempted oviposition. Formulae for two repellents are given, the more effective of which lasted for half an hour after application and consisted of 3 oz. oil of citronella, 1 oz. spirits of camphor, 1 oz. oil of tar, $\frac{1}{4}$ oz. oil of pennyroyal and 4 oz. castor oil.

HEADLEE (T. J.) & others. **Mosquito Control.**—*Rep. New Jersey Agric. Expt. Sta. 1926–27*, pp. 149–156, 1 pl. New Brunswick, N.J., 1928.

Notes are given on the mosquito campaign during 1926 [*cf. R.A.E.*, B, xvi, 142], and the emergence of mosquitos during the first half of 1927 is briefly discussed.

In the section of the report dealing with the effect of various chemicals on the spreading of mineral oils, by J. M. Ginsburg [*R.A.E.*, B, xvi, 50], it is stated that cresylic acid increases the toxicity of fuel oil, killing mosquito larvae instantly when diluted 1 : 1,000 and within 30 minutes when diluted 1 : 5,000, while recent field experiments have shown that fuel oil containing only 1 per cent. cresylic acid kills pupae much more rapidly than oil alone.

DA COSTA LIMA (A.). **Sobre algumas anophelinas encontradas no Brasil.** [On some Anophelines found in Brazil.]—*Sciencia medica*, vi, no. 5, pp. 249-251. Rio de Janeiro, May 1928.

In view of the divergent opinions of Brazilian workers and F. M. Root regarding the classification of Brazilian Anophelines of the *Nyssorhynchus* group, the author has bred and identified several of the species studied by the latter [*R.A.E.*, B, xiv, 197] and fully confirms his identifications.

SCHWETZ (J.). **Quelques considérations sur l'aspect entomologique de la lutte antimalarienne au Congo belge.**—*Ann. Soc. belg. Méd. trop.*, viii, no. 1, pp. 27-39, 4 refs. Brussels, June 1928.

The basis of measures for the control of mosquito larvae in the past has been the belief that without stagnant water there would be no mosquitos. Work has also been confined largely to the breeding-places of Anophelines. This is a mistake, however, for Anophelines frequently adapt themselves to Culicine breeding-places, and *vice-versa*. Knowledge of the mosquitos of the Belgian Congo, especially of the Anophelines, is very limited; to those previously recorded [*R.A.E.*, B, xv, 103] may be added *Anopheles pretoriensis*, Theo., *A. aureosquamiger*, Theo., *A. nili*, Theo., *A. marshalli*, Theo., *A. marshalli* var. *moucheti*, Evans, and *A. obscurus*, Grünb. *A. gambiae*, Giles (*costalis* Theo.) and *A. funestus*, Giles, and in some localities *A. marshalli* var. *moucheti* are the dominant species. Larvae of *A. funestus* are hard to find owing to their habits [*R.A.E.*, B, xii, 32], and the breeding-places of *A. gambiae* are very varied and difficult to trace, especially as the larvae are often scattered almost singly along the banks of rivers and streams. It is obvious, therefore, that stereotyped measures cannot be used under all circumstances and that local conditions and the biology of the mosquitos concerned must be studied before particular measures can be undertaken.

DUREN (—). **La lutte antimoustique à Léopoldville.**—*Ann. Soc. belg. Méd. trop.*, viii, no. 1, pp. 41-46. Brussels, June 1928.

The organisation and working of the anti-malarial campaign in Leopoldville (Belgian Congo) are described, and the mosquitos found are discussed. The dominating Anopheline is *Anopheles gambiae*, Giles (*costalis*, Theo.), which is ubiquitous, adapting itself to all kinds of breeding-places. While funds and staff are not adequate to undertake any project on a very large scale, much might be done if the work on the spot were planned scientifically.

WALCH (E. W.) & SARDJITO (M.). **Onderzoek naar den aard van het bloedmaal van Nederlandsch-Indische Anophelinen met behulp van de praecipitinen-reactie. (Eerste mededeeling.)** [Identification of the Blood-meal of Dutch East Indian Anophelines by means of the Precipitin Test. (First Communication.)]—*Geneesk. Tijdschr. Ned.-Ind.*, lxxviii, no. 2, pp. 247-268, 13 refs. (With a Summary in English.) Weltevreden, 1928; also in English in *Meded. Dienst Volksgezond. Ned.-Ind.*, xvii, pt. 2, pp. 234-250, 13 refs. Weltevreden, 1928.

Identifications of the blood in the stomachs of Anophelines in the Dutch East Indies were made by means of the precipitin test to ascertain

the importance of the various species as carriers of malaria. *Anopheles ludlowi*, Theo., the most dangerous carrier, and *A. subpictus*, Grassi (*rossi*, Giles), a vector of secondary importance, were both captured in houses in Java; 9 specimens of *A. ludlowi* all contained human blood, whereas this was the case with only 1 out of 26 of *A. subpictus*. Twenty-three of the latter and 14 others caught in houses in Celebes all contained blood from animals of the water-buffalo group. As a rule less than one per cent. of *A. subpictus* are infected with malaria in nature. The finding of engorged Anophelines in houses does not prove that they contain human blood. Of 13 *A. ludlowi* caught in houses near a buffalo shed 6 contained human blood, whereas of 26 caught inside the shed itself, 3 contained human blood. It is therefore of primary importance to take into account the relative number of animals present. As other domestic animals are very seldom bitten, attention can be concentrated on the buffalo-group. Of *A. vagus*, Dön., and *A. tessellatus*, Theo., both of no practical importance as malaria carriers, a few captured in houses in Java contained blood of the buffalo-group. Anophelines were also caught in houses in Kediri, Java. With *A. hyrcanus* var. *sinensis*, Wied., human blood occurred in 10, buffalo-group blood in 1 and chicken blood in 1; with *A. aconitus*, Dön., human blood occurred in 2, buffalo-group blood in 25; with *A. barbirostris*, Wulp, the blood in all of 4 cases was from the buffalo-group. *A. hyrcanus* var. *sinensis* is an important vector of malaria inland in Sumatra, while *A. aconitus* can scarcely be considered an important carrier at Kediri. *A. barbirostris* does not transmit malaria. On the other hand, all engorged females of *A. umbrosus*, Theo., from Borneo, *A. punctulatus*, Dön., from Ceram and New Guinea, and *A. bancrofti* var. *pseudobarbirostris*, Ludl., from New Guinea, contained human blood. Of these the first two are vectors of malaria.

SCHUURMAN (C. J.) & SCHUURMAN-TEN BOKKEL HUININK (A.). **Proefnemingen met Parijsch groen ter vernietiging van *Anopheles*-larven.** [Experiments with Paris Green for the Destruction of *Anopheles* Larvae.]—*Geneesk. Tijdschr. Ned.-Ind.*, lxxviii, no. 2, pp. 280-292, 3 figs., 7 refs. Weltevreden, 1928; also in English in *Meded. Dienst Volksgezond. Ned.-Ind.*, xvii, pt. 2, pp. 207-219, 3 figs., 7 refs. Weltevreden, 1928.

Laboratory experiments against Anopheline larvae were made with 1 per cent. of Paris green, containing 58.62 per cent. arsenious anhydride, mixed with various carriers. Of these magnesia (magnesium oxide) gave good results, but it is so light that it would be blown away by the least wind under practical conditions. A so-called acid clay was superior to dried cement, but occurs only in a few localities. A dry powder made from the red earth common throughout the Malay Archipelago was then used. A surface of half a square metre of water containing weeds was dusted with 5 cc. of the mixture. After 38 hours out of about 700 larvae only 4 large ones and 53 that were apparently too small to take the particles of Paris green were alive. In view of the small quantity used this result was excellent. The red earth also gave good results in large scale work. Stoxal [*R.A.E.*, B, xvi, 63] was found inferior to Paris green.

ESSED (W. F. R.). *Myzorrhynchus sinensis* var. *separatus* Leic. or *Myzorrhynchus hunteri* Strickland ?—*Meded. Dienst Volksgezond. Ned.-Ind.*, xvii, pt. 2, pp. 220–224, 14 figs. Weltevreden, 1928.

A description is given of the larva and adult of *Anopheles separatus*, Leic. (*sinensis*, Wied., var. *separatus*) from the Riouw Archipelago. It is compared with its variety *snijdersi*, Swell., and with *A. hunteri*, Strick. It was found breeding chiefly in clear well water or in slow running brooklets, usually, but not always, in the sun. Adults were taken in houses.

WILLIAMSON (K. B.) & RAJAMONY (P. D.). **Comparative Tests on the Larvicidal and Spreading Powers of Rubber, Crude and Solar Oils.**—*Malayan Med. J.*, iii, no. 2, pp. 88–92, 3 refs. Singapore, June 1928.

A detailed account is given of field and laboratory experiments against mosquito larvae with solar, crude and rubber oils, the results of which have been previously noticed [*R.A.E.*, B, xvi, 122].

BUDDLE (R.). **Entomological Notes on the Canton Delta.**—*J. Roy. Naval Med. Serv.*, xiv, no. 3, pp. 190–200. London, July 1928.

An annotated list of the mosquitos found in the Canton Delta includes: *Culex fatigans*, Wied., which is reputed to be a carrier of *Filaria [bancrofti]*, though filariasis is rare among the inhabitants of the Delta; *C. mimeticus*, Noé, and *Armigeres (Desvoidya) obturbans*, Wlk., the larvae of which are predacious on those of other mosquitos; *Aedes (Stegomyia) albopictus*, Skuse (*scutellaris*, Theo.), which is the vector of dengue; *Anopheles hyrcanus* var. *sinensis*, Wied., which is the principal vector of malaria in the Delta, and is prevalent at all seasons, being particularly abundant in January and February, the coldest months, when the temperature may be as low as 42° F.; *A. maculatus*, Theo., which is probably the vector of malaria in the foothills; *A. maculipalpis*, Giles, a doubtful carrier of malaria; *A. subpictus*, Grassi (*rossi*, Giles), which is not considered a vector in China but is regarded with suspicion in Java; and *A. kochi*, Dön., which is generally regarded as harmless.

All the Anophelines except *A. kochi* prefer clean, clear water, and turbid water seems fatal to most of them. It was found that when Anopheline larvae were carried in bottles in which a little mud or detritus had been placed as food they were frequently dead on arrival, whereas they thrived much better when they were carried in clear water and then transferred into a bottle in which the detritus had been allowed to settle. On the other hand, this was not often observed in the case of Culicine larvae, which survive very rough treatment. The suggested explanation is that while the body bristles of Culicines are simple, those of Anophelines are setose and tend to become clogged with fine suspended particles, which greatly hamper movement. The larvae apparently attempt to clean themselves but, except in the case of those of *A. kochi*, which are particularly active, the movements become more and more sluggish and they eventually die. This has a bearing on the seasonal breeding of *A. hyrcanus* var. *sinensis*, the larvae of which are seldom found in the rice-fields in summer owing to the Chinese custom of stirring up the mud by walking up and down

between the rows of growing rice at periodical intervals. This leaves the fields in a turbid condition, but after September, when the crop has been gathered, the water is left undisturbed and clear, and larvae are to be found in great numbers. They are also numerous in spring when the dried-up fields are flooded and the water is left undisturbed until the rice plants are well grown. In neglected or ill-cultivated rice-fields larvae are found in abundance throughout the warm months.

The natural enemies of mosquito larvae observed include gold fish, which will eat larvae but are very lazy and poor hunters, and a small Anabantid fish, which is very active and voracious. It feeds on the surface as well as below, which makes it valuable in the destruction of Anophelines, and it is also very hardy and thrives in the muddiest kind of water.

Among other insects observed was a Simuliid, and since *Phlebotomus* does not seem to exist in this locality, it is suggested that this insect may be the local vector of a three-day fever.

TEGONI (G.), FRUGIVUELE (T.) & WILLIAMS (L.). **Indice bibliografico della Malaria, 1926.** [Bibliography of Malaria in 1926.]—*Riv. Malariol.*, vii, nos. 2 & 4, Suppmts., pp. 1-36, 37-80. Rome, 1928.

In this index to the papers on malaria published in 1926 the references are arranged according to subjects, Section vi dealing with Anopheline mosquitos.

Transactions of the Second Conference on the Control of Malaria among Turf-pit Workers, 11-13 February 1928. [*In Russian.*]—8vo, 130 pp. Moscow, Gosudarstv. Med. Izd. [State Med. Publ.], 1928. (With a Summary in French.) Price 2 r. 25 k.

Reports from various workers in turf-pit areas throughout Russia deal chiefly with the clinical aspects of malaria and explain the importance of sanitary conditions and of quinine prophylaxis. Brief notes on oiling are also included. In the Vladimir Government oiling made no apparent difference to the numbers of *Anopheles maculipennis*, Mg., in human habitations, though the general mosquito population was reduced.

The measures against mosquitos carried out by the various malaria stations are briefly reviewed by V. V. Nikol'skii.

The work carried out by the hydrobiological division during the past three years is reviewed by A. N. Adova and B. M. Sebzentsov. Experimental observations have confirmed the dominating rôle of hydrogen ion concentrations as a primary factor influencing larval development in Anophelines and the selection of waters for oviposition. Larvae placed in artificial waters with a low pH died within the first two days, while the females avoided such waters, particularly when they contained a large quantity of organic matter and a low percentage of oxygen. An equal number of individuals emerged from waters with varying calcium content, but a higher calcium content was preferred for oviposition. This was possibly influenced by the chlorine ions introduced in combination with the calcium. In a small field experiment 0.02 per cent. of strong sulphuric acid was added to water containing a large number of Anopheline larvae, and all disappeared on the third day. The pH of the water was lowered from 6.03 to

2.09 and remained fairly constant for about a month. At the end of the second month it was 3.62 and by the end of the third month 5.29, but larvae were still absent.

[GROMASHEVSKIĬ (L. V.) & SHUKHAT (I. A.).] Гро́машевский (Л. В.) и Шухат (И. А.). **Mites in Human Faeces.** [In Russian.]—*Russ. J. Trop. Med.*, vi, no. 4, pp. 209–216, 4 figs., 14 refs. Moscow, 1928. (With a Summary in German, pp. 278–279.)

Examination of the faeces of 46 children from the environs of Odessa showed that 50 per cent. were infested by mites indistinguishable from *Tyroglyphus farinae*, L. All stages were present, including eggs. The high percentage of infestation is largely due to the particular diet, consisting mainly of farinaceous food and cheese, and the method of storing these in close proximity to grain, flour, etc.

[KOLMAKOV (A. I.).] Колмаков (А. И.). **Tropical Malaria in the Altai Government.** [In Russian.]—*Russ. J. Trop. Med.*, vi, no. 4, pp. 217–227, 10 refs. Moscow, 1928.

Malignant tertian malaria was not known amongst the native population of Siberia prior to 1923. The occurrence of the disease and its clinical aspects in the Altai Government since then are reviewed. It was believed that the cases were imported, but it now seems probable that the disease existed some time before its first record, and during 1927 the possibility of local infection by the agency of mosquitos was proved experimentally.

[TROITZKIĬ (N.).] Троицкий (Н.). **Bokhara Relapsing Fever.** [In Russian.]—*Mikrobiol. Zhurn.*, ii, pt. 3. (Abstract in *Russ. J. Trop. Med.*, vi, no. 4, pp. 275–276. Moscow, 1928.)

The symptoms and characteristics differentiating relapsing fever in Bokhara from the European and African forms of the disease are discussed. The transmitting agents are the ticks, *Ornithodoros tholozani*, Lab. & Mégn., and *O. lahorensis*, Neum., which infest camels, cattle and sheep and frequently occur in the native clay dwellings.

NICOLLE (C.) & ANDERSON (C.). **Présence au Maroc du spirochète de la fièvre récurrente d'Espagne.**—*Arch. Inst. Pasteur Tunis*, xvii, no. 2, pp. 83–107, 3 charts, 2 refs. Tunis, June 1928.

A preliminary account of the experiments described in detail in this paper has already been noticed [*R.A.E.*, B, xvi, 159]. An examination of the abandoned pig farm from which the infected individuals of *Ornithodoros maroccanus*, Velu, were obtained, and of the site of another in the same region that had been abandoned for eight years, showed that this tick was still abundant, associated with the faeces of rodents. The authors therefore consider that pigs are not necessary for the maintenance of *O. maroccanus* in nature, and that its natural hosts are rodents, from which it acquires infection, though the pig is a host on which the tick can multiply greatly. The Spanish and Moroccan forms of *Spirochaeta hispanica* are similar but not identical as regards pathogenicity and cross immunity, for while the former does not confer any immunity against the latter, the Moroccan form confers

partial resistance, or occasionally immunity, against the Spanish. For the Moroccan form the authors propose the name *S. hispanica* var. *marocana*, n.

[КНЯЗЕВСКИЙ (A. N.) & GRISHINA (P. K.).] Князевский (А. Н.) и Гришина П. К.). **Plague Epizootic of Mice in the Topolinsk Area of the Uralsk Government in 1927.** [In Russian.]—*C.R. 1er Congr. Anti-pesteux U.R.S.S., Saratov 1927*, pp. 87–90. Saratov, 1928. (With a Summary in French, pp. 453–454.)

The Topolinsk area of the Uralsk Government, on the right bank of the Ural river, has been found to be an endemic plague centre. The absence of human cases is apparently due to the scarcity of mice. An investigation was made of the rodents occurring under hayricks. They included house and field species. The living rodents did not harbour plague, but infection was demonstrated in dead individuals of *Microtus arvalis* and *Lagurus lagurus*. This is the first record of plague in the latter in south-east Russia. The fleas found in nests under the old ricks were *Ctenophthalmus breviatus*, Wagn. & Ioff, *Ceratophyllus laeviceps*, Wagn., *C. mokrzeckyi*, Wagn., *Amphipsylla rossica*, Wagn., and *Rhadinopsylla* sp. As the fleas could not be studied individually, they were dealt with in bulk, an emulsion of them being inoculated under the skin of a guineapig. The animal died of plague on the 11th day.

[GOLOV (D. A.) & IOFF (I. G.).] Голов (Д. А.) и Иофф (И. Г.). **On the Question of the Rôle of Fleas of Rodents in the South-East of U.S.S.R. in the Epidemiology of Plague.** [In Russian.]—*C.R. 1er Congr. Anti-pesteux U.R.S.S., Saratov 1927*, pp. 102–145, 1 fig. Saratov, 1928. (With a Summary in French, pp. 458–462.)

In the first part of this paper the various fleas occurring on rodents in Russia are reviewed, with particular reference to the distribution of plague. A series of experiments in which plague was transmitted to various rodents by means of infected individuals of *Oropsylla* (*Ceratophyllus*) *silantiewi*, Wagn., are described. In the second part of the paper a detailed account is given of transmission experiments and observations on the duration of infection in various species of fleas found on rodents in south-east Russia. Further details on this subject are given in a subsequent paper.

Extensive transmission experiments have been made with the following fleas: *O. silantiewi* usually found on *Marmota bobac*; *Neopsylla setosa*, Wagn., and *Ceratophyllus tesquorum*, Wagn., usually found on *Citellus pygmaeus* (of which *C. mugosauricus* and *C. musicus* are synonyms) and *C. guttatus*; and *Ceratophyllus mokrzeckyi*, Wagn., and *C. consimilis*, Wagn., usually occurring on mice. Transmission experiments with these fleas were successful with almost all the rodents that play any part in the epidemiology of plague. Infection may occur through the bite of the flea or as a result of the excreta being rubbed into the host. It may also occur through the mucous membrane of the mouth when the animals bite the fleas that attack them. Though most of the fleas are more or less specific to their host, they also undoubtedly pass from one species of host to another, and all the rodents harbour some fleas capable of biting man. All the above species attack man, but to what extent this occurs requires further investigation.

[NIKANOROV (S. M.) & GAĬSKIĬ (N. A.).] Никаноров (С. М.) и Гайский (Н. А.). **On the Question of the Rôle of Fleas as a Reservoir of Plague Infection.** [In Russian.]—C.R. 1er Congr. Antipesteux U.R.S.S., Saratov 1927, pp. 145-149. Saratov, 1928. (With a Summary in French, pp. 462-463.)

In order to ascertain whether the fleas attacking rodents are capable of harbouring plague infection for any length of time under natural conditions, collections were made in winter and spring from nests of ground squirrels [*Citellus*] in a locality where an epizootic occurred during the summer. Of 12,770 fleas collected 71 per cent. were *Neopsylla setosa*, Wagn., 13.5 per cent. *Ctenophthalmus pollex*, Wagn., 9 per cent. *Ceratophyllus tesquorum*, Wagn., and 6.5 per cent. *Frontopsylla semura*, Wagn. Experiments were carried out on 145 laboratory animals but all proved negative.

[BORZENKOV (A. K.), GOROKHOV (V. I.), FIRSOV (I. P.) & DONSKOV (G. D.).] Борзенков (А. К.), Горохов (В. И.), Фирсов (И. П.) и Донсков (Г. Д.). **On the Question of the Persistence of the Plague Virus in the Organism of Fleas.** [In Russian.]—C.R. 1er Congr. Antipesteux U.R.S.S., Saratov 1927, pp. 149-157. Saratov, 1928. (With a Summary in French, p. 463.)

Of the 5,845 fleas collected in winter from 144 nests of ground squirrels [*Citellus*], 79.7 per cent. were *Neopsylla setosa*, Wagn., 18.2 per cent. *Ceratophyllus tesquorum*, Wagn., and 2.1 per cent. *Ctenophthalmus pollex*, Wagn. The nests were chosen from an area that was known to be infected during the preceding seasons. All attempts to infect laboratory animals by means of these fleas proved negative, nor could a culture be obtained from any of the fleas. Fumigation of the nests during the summer with either chlorine or carbon bisulphide does not prevent the fleas from passing the winter in them, and they can remain in them even in the absence of a host, but they are apparently of no importance in conserving the plague virus from one epidemic to another.

[GOLOV (D. A.) & IOFF (I. G.).] Голов (Д. А.) и Иофф (И. Г.). **The Effect of various Conditions on the Persistence of the Plague Microbe in the Organism of Fleas and their different developmental Stages.** [In Russian.]—C.R. 1er Congr. Antipesteux U.R.S.S., Saratov 1927, pp. 158-175, 6 refs. Saratov, 1928. (With a Summary in French, pp. 464-467.)

Experiments have been made by feeding the larvae of *Ceratophyllus tesquorum*, Wagn., *C. fasciatus*, Bosc., *Neopsylla setosa*, Wagn., *Oropsylla silantiewi*, Wagn., and *Leptopsylla* (*Ctenopsylla*) *segnis*, Schönh. (*musculi*, Dugès) on heavily infected excreta of adult fleas or on small pieces of crushed spleen from infected animals. It was not possible to obtain a culture of the plague bacillus from the larval excreta more than 12 hours after feeding, nor was the infection ever passed on to the pupal or adult stages. When adult fleas have become infected, the plague bacillus remains virulent until the death of the flea, irrespective of whether the flea is starved or fed, or at what temperature it is kept. The virulence of the bacillus is also not affected when the flea is fed on the blood of pigeons. Both starved and fed fleas are apparently equally infective to laboratory animals. Transmission was successful

after starving *N. setosa* for 5 months, and to judge from the conditions of the infection in the flea it would probably have remained infective for a considerably longer period.

[IOFF (I. G.).] Иофф (И.). **Results of a Study of the Fleas of the South-East.** [In Russian.]—*C.R. 1er Congr. Antipesteux U.R.S.S., Saratov 1927*, pp. 204–241, 4 maps, 13 refs. Saratov, 1928. (With a Summary in French, pp. 470–473.)

A list is given of 48 species of fleas collected in south-east Russia, including some undescribed at the time of writing. Notes are given on their geographical distribution and the hosts on which they have been found. The majority of these fleas are not restricted to any specific host, and they may even be found on domestic animals and in human habitations, some attacking man.

[TIKHOMIROVA (M. M.) & ZAGORSKAYA (M. V.).] Тихомирова (М. М.) и Загорская (М. В.). **Rodents and their Fleas in the Novo-Kazansk and Slomikhinsk Regions of the Uralsk Government.** [In Russian.]—*C.R. 1er Congr. Antipesteux U.R.S.S., Saratov 1927*, pp. 242–248, 3 figs. Saratov, 1928. (With a Summary in French, p. 474.)

This is a short account of the topography of certain districts in the Uralsk Government, with a discussion of the rodents and the fleas found on them. *Ctenophthalmus pollex*, Wagn., *Neopsylla setosa*, Wagn., *Ceratophyllus tesquorum*, Wagn., and *C. mokrzeckyi*, Wagn., have been found on a number of rodents and also attack man.

[YATZENKO (F. I.).] Яценко (Ф. И.). **On the Organisation of Investigations on Ticks and Insects that come in Contact with Rodents.** [In Russian.]—*C.R. 1er Congr. Antipesteux U.R.S.S., Saratov 1927*, pp. 248–250. Saratov, 1928. (With a Summary in French, p. 475.)

The various diseases associated with Arthropod vectors throughout the world are briefly reviewed. The most important of these in U.S.S.R. is plague, in which connection a considerable amount of work has been done with fleas. The author points out the importance of considering other insects and ticks and suggests the lines on which such work should be inaugurated.

[TIFLOV (V. E.).] Тифлов (В.Е.). **A Study of the Fleas (Aphaniptera) of the Saratov Government.** [In Russian.]—*C.R. 1er Congr. Antipesteux U.R.S.S., Saratov 1927*, pp. 268–275, 2 figs., 3 refs. Saratov, 1928. (With a Summary in French, pp. 477–478.)

In view of the proximity of the Government of Saratov to the plague area of south-east Russia, an account is given of the fleas collected from various rodents during the period 1924–1926. Notes are given on the distribution and hosts of 20 fleas, including *Ctenophthalmus wagneri*, sp. n., in nests of *Microtus arvalis*, which is described in Russian and French.

[GRISHINA (P. K.) & STEPANOV (I. V.).] Гришина (П. К.) и Степанов (И. В.). **The Seasonal Variation of Fleas in the Burrows of *Citellus pygmaeus* in the Uralsk Government.** [In Russian.]-C.R. Ier Congr. Antipesteux U.R.S.S., Saratov 1927, pp. 275-277. Saratov, 1928. (With a Summary in French, p. 478.)

During the year ending April 1927, 9,789 fleas were collected from 255 nests of *Citellus pygmaeus* in the following proportions: *Neopsylla setosa*, Wagn., 49 per cent., *Ctenophthalmus* sp., 35 per cent., *Ceratophyllus tesquorum*, Wagn., 14 per cent., and *Frontopsylla semura*, Wagn., 2 per cent. Fleas are most abundant in the spring and autumn (September). While *N. setosa* predominates in the spring and *Ctenophthalmus* in the autumn, the numbers of *Ceratophyllus tesquorum* remain fairly constant.

FIELDING (J. W.). **Observations on Rodents and their Parasites.**—J. Roy. Soc. N.S.W., lxi, pp. 115-134, 30 refs. Sydney, 9th September 1927.

An account is given of the ectoparasites and endoparasites found in the course of the examination of rats during a period of 13 months, from September 1925 to September 1926, at Townsville, Queensland. Of the fleas found on 222 rats, 493 were *Xenopsylla cheopis*, Roths., 33 *Ctenocephalus felis*, Bch., 8 *C. canis*, Curt., 1 *Pulex irritans*, L., and 1 *Leptopsylla segnis*, Schönh. (*Ctenopsylla musculi*, Dug.). The monthly distribution of the rats and fleas captured is shown in a table; fleas were scarcest from January to May, and only one was found on 26 rats examined from March to May.

GOYLE (A. N.). **Comparative Experiments on the Transmission of Plague by Fleas of the Genus *Xenopsylla* (*cheopis* and *astia*) with a Discussion on the Flea-species Distribution in its Relation to the Incidence of Plague.**—Ind. J. Med. Res., xv, no. 4, pp. 837-860, 1 chart, 23 refs. Calcutta, April 1928.

The following is largely taken from the author's summary and conclusions: A series of plague transmission experiments, a few of which have already been noticed [R.A.E., B, xv, 207], were carried out with rats at Lucknow during the last plague season (October 1926-March 1927). With Madras rats plague was successfully transmitted in 7 out of 20 experiments by *Xenopsylla cheopis*, Roths., and in 3 out of 20 by *X. astia*, Roths., with Jhansi rats 18 out of 32 experiments were successful with *X. cheopis* and only 6 out of 32 with *X. astia*. In continuous transmission experiments 8 rats were successively infected with plague in cages with *X. cheopis*, while in the *X. astia* cages transmission ceased to occur after two rats had died of plague. From a study of the influence of climate, especially saturation deficiency and temperature, on the experimental transmission of plague, it is concluded that transmission by *X. cheopis* does not occur when the saturation deficiency is 0.6 of an inch accompanied by a temperature of 68° F. At the same temperature *X. astia* is checked by a saturation deficiency of 0.3 of an inch. The influence of saturation deficiency and temperature on the survival of the rat-fleas apart from their host has also been studied. *X. cheopis* lives longer than *X. astia*, and the females of both species live longer than the males. The geographical distribution of the fleas in its relation to the incidence of plague is discussed. It is suggested that the

species of flea is a factor of considerable importance, though not the only factor, involved in the spread of plague, and that the presence of *X. astia* to the exclusion of all other fleas over a large tract of country may possibly account for its immunity from plague. A method of freeing rats from fleas by dipping them in petrol is described.

CRAIGHEAD (A. C.) & SRIBAS DAS. **Report on a Sandfly Survey of Pusa Estate, Bihar.**—*Ind. J. Med. Res.*, xv, no. 4, pp. 861–872, 1 map, 1 chart, 9 refs. Calcutta, April 1928.

The sandflies found were *Phlebotomus papatasii*, Scop., *P. minutus*, Rond., *P. minutus* var. *niger*, Ann., *P. argentipes*, Ann. & Brun., and *P. squamipleuris*, Newst. *P. argentipes* occurred in nearly all houses that gave a recent history of infection with kala-azar and also in houses that had not been recently infected. During the period 20th June to 1st August 1926 sandflies caught in infected and uninfected houses were dissected, and one infected individual of *P. argentipes* was found among the 119 examined. It was found that *P. papatasii*, *P. minutus* and *P. squamipleuris* oviposited readily at 28° C. [82.4 F.], and large numbers of larvae and pupae were bred.

SENIOR-WHITE (R.). **Algae and the Food of Anopheline Larvae.**—*Ind. J. Med. Res.*, xv, no. 4, pp. 969–988, 1 pl., 14 refs. Calcutta, April 1928.

This paper on the food of Anopheline larvae incorporates the results of work done in Ceylon in 1925 and in North India in 1927. The following are the author's conclusions: Comparison of plankton with gut contents indicates that Anophelines are, in general, feeders on whatever organism occurs in greatest abundance in their medium, though there is evidence that diatoms, and perhaps fungus spores, are preferred foods. Copper sulphate is not effective against certain species of algae in much greater concentrations than are permissible in field work. Anopheline larvae have a filtration capacity of about 200–1,000 cu. mm. of water a day, according to the age of the larva. The greatest concentration of plankton in temporary rain pool breeding-places is not at the actual surface, but at some millimetres lower down, out of reach of Anopheline larvae, but available to Culicines.

COVELL (G.). **A Note on the Variations and Distribution of *Anopheles philippinensis* Ludlow.**—*Ind. J. Med. Res.*, xv, no. 4, pp. 1063–1065, 1 fig., 3 refs. Calcutta, April 1928.

The following is the author's summary: The distribution of *Anopheles philippinensis*, Ludlow, extends from the Philippines through Malaya to Burma, the Andamans, Bengal and Assam, and the species also occurs on the west coast of India.

Considerable points of difference exist between the typical eastern form as found in the Philippines and the form occurring in western India. These differences chiefly concern the relative proportions of dark and pale scaling on the hind tarsi and wings. An examination of specimens from eastern India and Malaya, however, shows that these forms gradually merge into one another. It seems advisable, therefore, to consider them as local variations of one species, rather than to attempt to separate them as named varieties.

MAYNE (B.). **A Note on some recent Attempts to transmit Malaria Organisms mechanically through Mosquito biting.**—*Ind. J. Med. Res.*, xv, no. 4, pp. 1067–1071, 1 pl., 5 refs. Calcutta, April 1928.

In investigating the question of the minimum dose required to produce infection with benign tertian malaria (measured by the infective bites of mosquitos) in the United States, it was found that three Anophelines, infected by biting a gametocyte carrier 18 days previously, conveyed malaria when allowed to probe the skin for 50 seconds, 35 seconds and 15 seconds respectively. Owing to the ease with which this infection was transmitted cyclically, experiments were carried out to test the possibility of mosquitos transferring the parasites immediately. Mosquitos allowed to draw blood for less than a minute from a malaria patient were then rapidly transferred and allowed to engorge on uninfected hosts. Eight tests were completed with *Aedes thibaulti*, D. & K., using 2–15 mosquitos on both hosts, and four with *Anopheles quadrimaculatus*, Say, in which from 3 to 40 were used. None of the twelve subjects contracted malaria. Forty-five of the Anophelines survived for 15 days and were fed over a period of 3 days on two uninfected hosts, both of whom developed malaria in 16–17 days following the last feeding.

It is thought that mechanical transmission might possibly be a factor in a malaria epidemic, especially in the absence of a large number of suitable gametocyte reservoirs, when the rapid dissemination might possibly be ascribed to the partial agency of swarms of insects effecting a direct transfer of asexual parasites. To determine whether the proboscis of the mosquitos used in these experiments still retained parasites following the interrupted bite, examinations were made of the dissected mouth-parts. Where dissection was performed before the mosquito was permitted to bite the second host, parasites were observed. In one case when an Anopheline was fed on an infected patient for two minutes, interrupted for 40 seconds and then fed on the uninfected host for fifty seconds, no malaria organisms were found, although blood elements were distinguished in the proboscis. It was found that the stomach contents of one Anopheline injected subcutaneously produced malaria. In this particular instance numerous ring forms of *Plasmodium vivax* were observed in the blood of the patient on which the mosquito had fed. It is presumed that unless a mosquito regurgitates its stomach contents almost immediately into the abraded skin of its second host, infection is not likely to result. It has been determined that an average-sized Anopheline may imbibe about 3 milligrams, an amount of blood equal to its body-weight. Another factor that may account for the failure of mechanical transmission is the rapid drying of the infected blood on the external surfaces of the exposed mouth-parts. For it has been demonstrated that, although a subcutaneous injection of as little as one minim of blood suffices to produce malarial infection, the organisms are destroyed when infected blood is left to dry at the temperature of the air for a very short time. During attempts to prolong the life of the mosquito by supplementing blood diet with fruit juices, it was found possible to recover sporozoites from infective Anophelines. Sterile dates were placed in the cages after the usual incubation period and active sporozoites were recovered from beneath the skin of this fruit. This discharge of sporozoites was associated with the efforts of the mosquito to pierce the skin of the fruit and suck its juices. Motile sporozoites were observed up to fifteen hours after the removal of the fruit from the mosquito cages. It was feasible

to inject this material in a bacteria-free condition into a human host, though the organisms were apparently too few, or did not survive to convey the infection.

MAYNE (B.). **The Influence of Relative Humidity on the Presence of Parasites in the Insect Carrier and the Initial Seasonal Appearance of Malaria in a Selected Area in India.**—*Ind. J. Med. Res.*, xv, no. 4, pp. 1073–1084, 1 chart, 12 refs. Calcutta, April 1928.

The author reviews the literature dealing with the relation of temperature and humidity to malaria incidence and gives an account of an investigation carried out from the latter part of February to the latter part of September 1927 to determine the initial seasonal appearance of malaria and some factors influencing it in the District of Saharanpur in the United Provinces. The town of Saharanpur is completely surrounded by groves of fruit trees and areas of rice, wheat and sugar-cane, and the faunal conditions are probably influenced by excessive irrigation and defective drainage, which causes waterlogging of the soil during the rainy seasons. The work consisted essentially in collecting and dissecting the common Anophelines from four villages within a three mile radius of Saharanpur. The incidence of malaria was determined by a splenic index of village children, and a sufficient parasite index was obtained to indicate the infection risk of persons residing in the district.

Dissections were made of the five predominant species of *Anopheles*, which first appeared in native habitations at the following times: *A. fuliginosus*, Giles, during the first week in March, *A. maculipalpis*, Giles, during the second week in March, *A. culicifacies*, Giles, during the second week in April, *A. stephensi*, List., during the first week in May, and *A. subpictus*, Grassi, during the last week in June. During the 7 months the relative abundance of these species was as follows: *A. culicifacies* 40 per cent., *A. subpictus* 32.6 per cent., *A. fuliginosus* 17.3 per cent., *A. maculipalpis* 5.1 per cent., and *A. stephensi* 4.9 per cent. Five infected mosquitos (four *A. culicifacies* and one unnamed) were collected between 9th August and 8th September. The humidity records for the seven months show a striking correlation between this period and that of maximum humidity. The highest mean percentage of relative humidity occurred during the first week in August, rising from 78 and 80 during the last two weeks of July to a mean of 99, which was maintained in slightly decreased amount until the second week in September. The author discusses the probable effect of humidity in connection with relapses of malaria in man, with the possible number of blood meals taken by the mosquito and with the process of ex-flagellation of the parasite necessary for the production of the sporogonic cycle. The time of application of remedial measures is also discussed, and the author suggests that the favourable time in an endemic focus of circumscribed area would probably be when latent or residual malaria only were present, and the possibility of re-infection at a negligible stage.

JACK (R. W.). **Ticks infesting Domestic Animals in Southern Rhodesia.**—*Rhodesia Agric. Jl.*, xxv, nos. 5 & 6, pp. 537–556 & 704–716, 3 pls., 13 refs.; also as *Bull. [Minist. Agric. S. Rhodesia]*, no. 696, 32 pp., 3 pls., 13 refs. Salisbury, Rhodesia, May–June 1928.

This is a popular account of the bionomics and control of the ticks that infest domestic animals and fowls in Southern Rhodesia, with

notes on their distinguishing characters and the diseases that they transmit. Several species that are found in other parts of South Africa, but are not at present known to occur naturally in Southern Rhodesia, are also included. In discussing the manner in which ticks are killed by arsenical dips, the author points out that such ticks as *Hyalomma aegyptium impressum*, Koch, are much more resistant to dipping than ticks of the genera *Rhipicephalus* and *Boophilus*; this may be because they have a much longer proboscis that penetrates too far through the skin of the cattle to take up the arsenic in the tissues immediately underlying it, or because the females, being larger and having tougher skins, are less well covered by the hair of the host and absorb less arsenic from it. The fact that the early stages of *Hyalomma* are passed on wild, or at any rate undipped, hosts also gives this tick a great advantage.

SINCLAIR (J. M.). **Report of the Chief Veterinary Surgeon, Southern Rhodesia, for the Year 1927.**—Fol., 9 pp. Salisbury, Rhodesia, 1928.

Several outbreaks of heartwater in cattle occurred in Southern Rhodesia in 1927, first among a consignment of bulls collected from various parts of the Colony, and later among cattle moved on account of drought into parts of the veldt infested with the bont tick (*Amblyomma* sp.). From the fact that locally-bred cattle in the latter districts were not affected, it is probable that the disease has occurred there for some time and that local cattle are immune. The appearance of heartwater in Southern Rhodesia is not surprising in view of the gradual spread of its vector, the bont tick, inwards from the southern and western boundaries of the Colony that has been taking place for some years.

Forty-one head of cattle died of trypanosomiasis in one district in which tsetse-flies [*Glossina*] have never been found.

The reduction in the numbers of the bont-legged tick [*Hyalomma aegyptium impressum*, Koch] by dipping is considered to be responsible for a diminution in infestation of cattle by the screw-worm fly [*Chrysomya bezziana*, Villen.] Injuries to the skin caused by this tick account for most of the cases of screw-worm infestation.

FREEBORN (S. B.), REGAN (W. M.) & FOLGER (A. H.). **The Relation of Flies and Fly Sprays to Milk Production.**—*J. Econ. Ent.*, xxi, no. 3, pp. 494–501, 2 charts. Geneva, N.Y., June 1928.

The results of two years of investigation indicate that the loss in milk production caused by flies is sometimes greatly overestimated and that often greater harm to the cows results from fly sprays than from the flies.

The following is the authors' abstract: This paper presents data gathered to check results secured during the summer of 1925 [*R.A.E.*, B, xiv, 27] and to attempt to ascertain the causes for losses in production that resulted from spraying. Exposing high-producing cows to an exceedingly heavy infestation of house-flies (*Musca domestica*, L.) did not result in lowered production. In the absence of flies, sponging with water had no effect on production; spraying with water caused a loss of 5.4 per cent., with pine tar-cresote a loss of 6.9 per cent., and with oil a 9.7 per cent. loss. During the last two weeks of spraying, the loss

in production was 12·5 per cent. for the pine tar-creosote and 22·8 per cent. for the oil-sprayed groups. The body temperature was consistently higher, sometimes as much as 3° F. for the oil-sprayed group than for the controls. The respiration rate of the former averaged 40 per cent. higher than that of the latter.

BOAS (J. E. V.). **Kampen mod Oksebremseplagen i Danmark. Med en Udsigt over Oksebremsernes Naturhistorie.** [The Fight against the Ox Warble Pest in Denmark, with an Outline of the Life-history of the Fly.]—*Festskrift f. Bernhard Bang*, reprint 39 pp., 11 figs., 26 refs. Copenhagen, 1928.

The author gives a general account of the life-history of the ox warble-flies, *Hypoderma bovis*, DeG., and *H. lineatum*, Vill., partly from his own investigations and partly from the literature. He agrees with the view that the eggs are laid mainly on the legs, particularly the lower part of the hind legs, and considers that only those larvae that reach the backs of the cattle develop fully, while others elsewhere die off. Small larvae were found in the oesophagus in March, April and May (when larvae are normally established in the backs of cattle), and a degenerate larva in the latter month. In the oesophagus the larvae are smaller in the spring than in the winter.

An account is given of measures against the flies in Denmark, and instances of successful control by individuals are mentioned. In 1923 legislation was passed respecting the eradication of the larvae, and revised in 1924 [cf. *R.A.E.*, B, xi, 110; xv, 45]. As a result the percentage of hides damaged has dropped from 23 in 1922 and 17 in 1923 to an average of 4–6 in recent years, the actual figures varying in different localities. In Jutland the number of damaged hides increased a little in 1926, which is believed to have been due to a great outbreak of foot-and-mouth disease, which hindered the eradication of the larvae and the inspection of stocks.

LEYNEN (E.). **Traitement de l'hypodermose du boeuf.**—*Ann. Méd. vet.*, lxxiii, no. 5, pp. 202–204. Brussels, May 1928.

BERTRAND (G.). **Au sujet de l'hygiène de la peau des animaux d'abatage.**—*Ibid.*, pp. 205–213.

Both these papers discuss the methods of controlling *Hypoderma* in cattle and draw attention to the success that has been obtained in Denmark by making the destruction of all warble maggots in cattle compulsory [see preceding paper], while the second also gives an account of the biology of *Hypoderma*. The Belgian order of 17th March 1924, providing for the removal of warble maggots from cattle sent to markets or shows or for export, is considered totally inadequate.

GANSSE (A.). **Letale Wirkungen bei medikamentöser Behandlung sowie Exstirpation von Hypodermenlarven.** [Lethal Effects in the Treatment of *Hypoderma* Larvae with Medicaments and the Removal of the Larvae.]—*Schweiz. Arch. Tierheilk.*, lxx, pp. 197–200, 1928. (Abstract in *Deuts. tierärztl. Wschr.*, xxxvi, no. 23, p. 404. Hanover, 9th June 1928.)

It is suggested that the lack of success attending the treatment of *Hypoderma* larvae with chlorine or sulphur dioxide may be due to the action of these gases being nullified by the alkaline reaction of the serum

that flows into the hole when the larva draws back on the application of the gas. Paradichlorobenzene ointment has not proved successful in Germany. Carbolic ointment is effective but taints the flesh and may be dangerous to the animal if licked off. To obtain uninjured larvae for experimental work, they should not be squeezed out, but gently loosened from the tissue on the inside of a newly flayed hide.

MACDOUGALL (R. S.). **Insect Pests, I-III. Insects injurious to Farm Animals.**—*Scot. J. Agric.*, xi, nos. 2-4, pp. 147-157, 325-339 & 450-470, 20 figs. Edinburgh, April, July & October 1928.

Brief accounts are given of the insects and mites attacking farm animals in Britain with recommendations for their control. Keys are given to the species of Anoplura and the genera of mites.

AUSTEN (E. E.). **The House-fly, its Life-history, Importance as a Disease Carrier and practical Measures for its Suppression.**—*Econ. Ser. Brit. Mus. (Nat. Hist.)*, no. 1a, 3rd edn., 71 pp., 2 pls., 7 figs., numerous refs. London, 1928. Price 1s.

The chief additions in this revision [*cf. R.A.E.*, B, xiv, 101] concern the use of calcium cyanide against house-flies (*Musca domestica*, L.) in the United States [B, xv, 147] and alternative methods for the suppression of house-fly breeding in refuse dumps. If borax cannot be used for treating these dumps, it is possible to prevent fly breeding by immediately covering all fresh deposits of refuse either with earth or with sheets of hessian soaked in heavy oil. In the first case, not less than two feet of soil, six inches of which has been mixed before use with green tar oil at the rate of 1 gal. to 40 gals. earth, must be rammed as hard as possible. In the second case, the surface of the dump should be made as smooth as possible and the sheets, which may be moved after 10-14 days, should be weighted down.

BRITTON (W. E.). **Twenty-seventh Report of the State Entomologist of Connecticut, 1927.**—*Connecticut Agric. Expt. Sta.*, Bull. 294, pp. 198-299, 16 pls., 11 figs. New Haven, Conn., February 1928.

In the course of this report a short account is given of an outbreak of the European hen flea, *Ceratophyllus gallinae*, Schr., in a garden in Connecticut [*R.A.E.*, B, xvi, 198]. This is apparently the first record of this species in this State.

BOTSFORD (R. C.). **Mosquito Control Work in Connecticut. Season of 1927.**—*Connecticut Agric. Expt. Sta.*, Bull. 294, pp. 291-296 & p. 298. New Haven, Conn., February 1928.

Of the thirty or more species of mosquitos known in Connecticut, those breeding in salt water are by far the more troublesome, as they bite at any time of the day or night, breed in greater numbers than the fresh water species, and fly long distances. It is therefore chiefly against these that control measures are directed, the work consisting of drainage and ditching. A new type of spade for cutting ditches is described and illustrated. This has two wooden handles joined by a crosspiece; the spade cuts a ditch 10 inches wide and has a long slot in the centre of the blade for suction relief, while wings project forward for cutting the sides of the ditch.

MILOVIDOV (P. F.). **A propos des bactéroïdes des blattes** (*Blattella germanica*).—*C.R. Soc. Biol.*, xcix, no. 20, pp. 127–128. Paris, 15th June 1928.

Observations on the bacterioids in aseptically reared individuals of *Blattella germanica*, L. [*R.A.E.*, B, xiv, 168] are described; they are considered to offer additional proof of the bacterial nature of these bodies.

BANCROFT (T. L.). **Flagellates in certain Queensland Plants. Preliminary Notes.**—*Proc. R. Soc. Queensland*, xxxix (1927), p. 22. Brisbane, 14th February 1928.

Three species of flagellates were found in the latex of four out of twelve species of plants examined in Queensland, this being the first record of plant flagellates in Australia. One species occurred in the Asclepiads, *Sarcostemma australe* and *Hoya australis*, the second in another Asclepiad, *Secamone elliptica*, and the third in *Ficus scabra*. Flagellates were also found in the intestines of a Lygaeid, *Oncopeltus quadriguttatus*, F., that occurs constantly on *Hoya* and will also suck the juice of *Sarcostemma*. The forms in the bugs were larger than those in the plants.

BACIGALUPO (J.). **L'évolution de l'*Hymenolepis nana*.**—*C.R. Soc. Biol.*, xcix, no. 21, p. 239. Paris, 22nd June 1928.

The author has found that the Cestode, *Hymenolepis nana*, which occurs in 5–10 per cent. of the children in Buenos Aires, is capable of completing its development either with or without an intermediate insect host. When individuals of *Tenebrio molitor*, L., were given the opportunity to eat eggs of the parasite, 10 per cent. became infected.

MOMMA (K.). **On a Case of *Hymenolepis diminuta* Rud., 1819.**—*Ann. Trop. Med. Parasit.*, xxii, no. 1, pp. 1–3, 7 refs. Liverpool, 12th June 1928.

The occurrence in Japan of *Hymenolepis diminuta* in the faeces of an infant eight months old is recorded, and the insect hosts of this Cestode are briefly discussed. In Japan, G. Hongo found experimentally that the following insects could serve as intermediate hosts: *Pyralis farinalis*, L., *Aglossa dimidiata*, Hw., *Tribolium castaneum*, Hbst. (*ferrugineum*, F.), *Paralipsa gularis*, Zell., and *Tinea granella*, L.

DUKE (H. L.). **On the Effect on the Longevity of *G. palpalis* of Trypanosome Infections.**—*Ann. Trop. Med. Parasit.*, xxii, no. 1, pp. 25–32. Liverpool, 12th June 1928.

This paper presents data obtained in Uganda on the longevity of 1,066 individuals of *Glossina palpalis*, R.-D., infected with *Trypanosoma rhodesiense* or *T. gambiense*, and 13,257 individuals that failed to become infected. All the flies were bred in the laboratory. The percentage of flies that became infected when given an infective feed even under the most favourable conditions obtainable was rarely as high as 20. It is clearly shown that little or no disturbance is caused

by the presence of the flagellates, at least during the first 30-40 days of the fly's life in captivity. On the other hand, the evidence lends no direct support to the impression previously formed by the author that the presence of a flagellate infection in its intestine is beneficial to the fly.

SAMBON (L. W.). **The Parasitic Acarians of Animals and the Part they play in the Causation of the eruptive Fevers and other Diseases of Man. Preliminary Considerations based upon an ecological Study of Typhus Fever.**—*Ann. Trop. Med. Parasit.*, xxii, no. 1, pp. 67-132, 19 figs. Liverpool, 12th June 1928.

This paper contains much historical and other information concerning the epidemiology of the diseases (Rocky Mountain spotted fever, tsutsugamushi disease, etc.) that the author considers to be local forms of typhus in various parts of the world, in support of his main thesis of the importance of ticks and mites, particularly Trombidids, in their transmission. The author stresses the importance of various rodents, particularly Murids, as reservoirs of typhus; a study of the ecology of these animals shows that their habitats are those of the various mites believed to be concerned in the dissemination of the disease.

In a discussion of the epidemiology of chicken-pox, the author suggests that this disease may be conveyed from birds to man by *Dermanyssus gallinae*, DeG., and *Liponyssus (Ornithonyssus) sylvarum*, C. & F., and possibly by various fleas and bugs (*Cimex*).

The last part of the paper consists of the descriptions of eleven new species of Trombidiid larvae found under the skin of batrachians from various parts of the world.

SAMBON (L. W.). ***Psorergates simplex* as a possible Factor in Epithelioma of the Skin and Mammary Glands in Murids.**—*Ann. Trop. Med. Parasit.*, xxii, no. 1, pp. 133-136, 2 figs. Liverpool, 12th June 1928.

The author briefly reviews previous records of the relations of mites to cancerous growths in animals and discusses two cases in which cancers occurred in mice in association with cysts containing numerous specimens of the Cheyletid mite, *Psorergates simplex*, Tyrrell, one being on the hind leg and the other in the mammary gland.

EDWARDS (F. W.). **Diptera Nematocera from the Federated Malay States Museums.**—*J. F. M. S. Mus.*, xiv, pt. 1, pp. 1-139, 2 pls. Kuala Lumpur, 1928.

The account of the CULICIDAE in this paper includes a list of the mosquitoes of the Malay Peninsula, the total number being 198. Six species of *Simulium*, five of which are described as new. *Phlebotomus perturbans*, de Meij., and *P. malabaricus*, Annan., are also recorded from the Peninsula.

PAPERS NOTICED BY TITLE ONLY.

STILES (C. W.) & HASSALL (A.). **Key-Catalogue of Insects of Importance in Public Health.**—*Bull. Hyg. Lab. U.S. Publ. Hlth. Serv.*, no. 150, pp. 291-408. Washington, D.C., 1928.

- FERRIS (G. F.). **The Mallophagan Family Menoponidae. Part iii.**—*Parasitology*, xx, no. 2, pp. 221–227, 3 figs. Cambridge, July 1928.
- KRÖBER (O.). **Die amerikanischen Arten der Tabaniden-Subfamilie Diachlorinae End.**—*Arch. Schiffs- u. Tropenhyg.*, xxxii, Beiheft 2, 55 pp. Leipzig, 1928.
- EWING (H. E.). U.S. Bur. Ent. **A Preliminary Key to the Larvae of fifteen Species of the Mite Genus *Trombicula*, with Descriptions of four new Species.**—*Proc. Ent. Soc. Wash.*, xxx, no. 5, pp. 77–80. Washington, D.C., May 1928.
- HOLLANDE (A. C.) & AGHAR (M.). **La phagocytose et la digestion des bacilles tuberculeux par les leucocytes du sang des chenilles autres que *Galleria mellonella*.**—*C.R. Soc. Biol.*, xcix, no. 20, pp. 120–122, 1 fig. Paris, 15th June 1928.
- STEWART (M. A.). **Two new Siphonaptera from Colorado** [on Rodents].—*Canad. Ent.*, lx, no. 6, pp. 148–151, 1 pl. Orillia, Ont., June 1928.
- [SMIRNOV (A. F.) & GUGENOTOVA (S. A.).] Смирнов (А. Ф.) и Гугенотова (С. А.). **On the Biology of the Jerboa, *Dipodipus sagitta* [with a List of Fleas infesting it].** [In Russian.]—*C.R. 1er Congr. Antipesteux U.R.S.S.*, Saratov 1927, pp. 434–441, 7 figs. Saratov, 1928. (With a Summary in French, pp. 496–498.)
- LANGERON (M.). **Les larves anormales de moustiques, ou larves à collier et à cerceaux.**—*Ann. Paras. hum. comp.*, vi, no. 3, pp. 273–283, 16 figs., 2 refs. Paris, 1st July 1928.
- O'FLYNN (J. A.). **Incidence of Malaria at H.M. Naval Base, Singapore.**—*J. Roy. Naval Med. Serv.*, xiv, no. 3, pp. 178–187, 1 graph. London, July 1928. [Cf. *R.A.E.*, B, xvi, 153.]
- COVELL (G.). **A Note on Variations of the Hind Tarsal Markings in *Anopheles fuliginosus* Giles and *Anopheles ramsayi* Covell.**—*Ind. J. Med. Res.*, xv, no. 4, pp. 1059–1062, 12 refs. Calcutta, April 1928.
- SENIOR-WHITE (R.). **On the Relationship existing between Carbonates and pH and Conductivity in Natural Waters.**—*Ind. J. Med. Res.*, xv, no. 4, pp. 989–996, 2 figs., 9 refs. Calcutta, April 1928.
- EVANS (A. M.). **A new Variety of *Armigeres* from Lagos, with Descriptions of the Larval and Pupal Stages.**—*Ann. Trop. Med. Parasit.*, xxii, no. 1, pp. 39–42, 2 figs., 5 refs. Liverpool, 12th June 1928.
- BRUG (S. L.). ***Anopheles* (*Neomyzomyia*) *longirostris* n. sp.** [in New Guinea] (*Diptera, Culicidae*).—*Geneesk. Tijdschr. Ned.-Ind.*, lxviii, no. 2, pp. 278–279, 1 pl. Weltevreden, 1928; also in English in *Meded. Dienst Volksgezond. Ned.-Ind.*, xvii, pt. 2, pp. 424–425. Weltevreden, 1928.
- POLAK (H. J.). **Flit-dermatitis.** [Dermatitis caused by "Flit."]—*Geneesk. Tijdschr. Ned.-Ind.*, lxviii, no. 2, pp. 297–298. Weltevreden, 1928.

MEGAW (J. W. D.) & RAO (S. Sundar). **Tick-typhus and other sporadic Fevers of the Typhus Group.**—*Ind. Med. Gaz.*, lxiii, no. 6, pp. 306–318, 2 pls., 20 charts, 1 table, 13 refs. Calcutta, June 1928.

The literature on typhus-like fevers in various parts of the world is briefly reviewed, and reports by various medical men on a number of recent cases of fevers of this type in India are given; in several of these it is recorded that the patients were bitten by ticks, but no species is mentioned. The part played by ticks in the transmission of fevers of the typhus group, and the relationship between the forms of typhus conveyed by lice [*Pediculus*], ticks and mites, are discussed. The following is taken from the authors' summary and conclusions:—

There are certain fevers the clinical manifestations and pathology of which point to their belonging to the same group, the "typhus group of fevers." One of these is known to be conveyed by lice, and therefore may be called louse-typhus. Another, Rocky Mountain spotted fever, may be called tick-typhus, and the third, tsutsugamushi disease, can appropriately be called mite-typhus. There are other examples of tick-borne and mite-borne typhus; hence the necessity of devising names of universal applicability.

There are many places in which sporadic typhus-like fever of unknown vector occurs: in the present state of our knowledge it is most suitable to designate these as "typhus-group fevers." Most of these cases occur under conditions that suggest that an Arthropod of the wilds conveys the infection from a rodent reservoir, and it is therefore desirable that they should be investigated with special reference to ticks, mites and other possible Arthropods. So far as India is concerned, all the available evidence points rather strongly to a tick as the vector. The possibility of a typhus virus being conveyed by two alternative Arthropods, especially the louse and the tick, ought to be further investigated.

FIEBIGER-GERTZ (C.). **Un diptère ectoparasite sur un phasme:** *Ceratopogon ixodoides* n. sp.—*Ann. Paras. hum. comp.*, vi, no. 3, pp. 284–290. Paris, 1st July 1928.

Ceratopogon ixodoides, sp. n., is recorded from Paraguay as attacking Phasmids. All the individuals captured were females, 10 or more being found on a single host. The midge remains fixed on the same spot on its host until its eggs are fully developed, when its abdomen is more than one hundred times the size of the rest of its body.

RONDEAU DU NOYER (M.). **Parasitisme accidentel de myriapodes chez l'homme.**—*Ann. Paras. hum. comp.*, vi, no. 3, p. 368. Paris, 1st July 1928.

Two cases are recorded of the occurrence of Myriapods in the digestive tract of young children in France, the species being *Scutigera coleoptrata*, L., and *Geophilus linearis*, Koch. In each case the Myriapod was still alive when evacuated several days after the treatment of the patient, and morbid symptoms ceased immediately afterwards.

MYERS (L. E.). **The American Swallow Bug, *Oeciacus vicarius*, Horváth (Hemiptera, Cimicidae).**—*Parasitology*, xx, no. 2, pp. 159–172, 4 pls. Cambridge, July 1928.

An account is given of the external structure and biology of *Cimex* (*Oeciacus*) *vicarius*, Hor., which is a parasite of swallows in North America. This species is quite distinct from the European swallow bug, *C. hirundinis*, Jenyns. The bugs attack man, but do not appear to adapt themselves readily to living upon him or in his dwellings.

WARBURTON (C.). ***Ornithomyia avicularia* (Diptera Hippoboscidae) as the Carrier of Mallophaga, with some Remarks on Phoresy in Insects.**—*Parasitology*, xx, no. 2, pp. 175–178, 1 fig., 8 refs. Cambridge, July 1928.

A Hippoboscid, *Ornithomyia avicularia*, L., was found with twelve adults of *Degeeriella marginalis*, Nitz., firmly attached by their mouth-parts to the hairs of the abdomen. These lice are usually found on blackbirds, which the fly in question had probably been infesting. Similar examples of this phenomenon in other insects are cited, some being cases of simple migration and others cases where there is distinct prospect of conveyance to the host or spot desired.

WARBURTON (C.). **The Harvest Bug.**—*Parasitology*, xx, no. 2, pp. 228–236, 2 figs., 20 refs. Cambridge, July 1928.

The author gives an account of the present state of knowledge of the Trombidiid mites known to attack man in various parts of the world. The generic names *Trombidium*, *Microtrombidium*, *Leptus* and *Leeuwenhoekia* have all been founded on larval characters, and are therefore of doubtful validity. The genus that is valid is *Trombicula*, as the adult of *T. akamushi*, Brumpt, has been reared. The list comprises the principal harvest mites: *Acarus batatus*, L., the life-history of which is unknown; *Leptus autumnalis*, Shaw, of which the female nymph has been described by Hirst and placed by him in the subgenus *Neotrombicula*; *Trombidium americanum*, Riley; *Trombicula* (*T.*) *irritans*, Riley, the adult having been stated to have been reared by Ewing; *Microtrombidium* (*Trombidium*) *tlalsahuatl*, Brumpt; *Trombicula* (*M.*) *wickmanni*, Oud., *T. (M.) vandersandei*, Oud.; *T. deliensis*, Walch; *T. schüffneri*, Walch; and *Leeuwenhoekia australiensis*, Hirst. [Cf. also *R.A.E.*, B, xiii, 178; xiv, 74; xvi, 109.]

ANDERSON (T. E.). **Récupération de la virulence du *Spirochaeta gallinarum* par inoculation d'une émulsion d'*Argas persicus* à des poussins et à des embryons de poulets.**—*C.R. Soc. Biol.*, xcix, no. 23, pp. 378–379. Paris, 6th July 1928.

Experiments showed that a strain of *Spirochaeta gallinarum* that had entirely lost its virulence for adult fowls could be regenerated by inoculation into very young chickens and chicken embryos of an emulsion of infected individuals of *Argas persicus*, Oken, at a time when the tick appeared no longer able to transmit the infection to adult fowls.

LWOFF (M.). **Action favorisante du sang sur la culture du *Leptomonas ctenocephali* Fanth. (flagellé trypanosomide).**—*C. R. Soc. Biol.*, xcix, no. 24, pp. 472-474, 6 refs. Paris, 13th July 1928.

Experiments are described with various media containing blood for the culture of *Herpetomonas* (*Leptomonas*) *ctenocephali* var. *chattoni* from the alimentary tract of *Ctenocephalus canis*, Curt.

LE GAC (—). **Notes sur quelques cas de fièvre à pappataci observés à Abéché et sur les phlébotomes du Ouadaï (Tchad).**—*Gaz. hebdom. Sci. méd. Bordeaux*, xlix, no. 3, p. 38, 8 figs. Bordeaux, 1928. (Abstract in *Bull. Inst. Pasteur*, xxvi, no. 13, p. 620. Paris, 15th July 1928.) Also in *Ann. Méd. Pharm.*, xxvi, no. 2, pp. 215-227, Paris, 1928.

The author studied several cases of sandfly fever in the Wadai district of the Chad territory, and found that sandflies were numerous in the region; *Phlebotomus africanus*, Newst., was much the commonest, but *P. duboscqui*, Nev.-Lem., also occurred.

BAUER (J. H.). **The Transmission of Yellow Fever by Mosquitoes other than *Aedes aegypti*.**—*Amer. J. Trop. Med.*, viii, no. 4, pp. 261-282, 14 refs. Baltimore, Md., July 1928.

Experiments with various Culicines were carried out at Lagos to determine whether they were able to transmit yellow fever from infected monkeys (*Macacus rhesus*) to healthy ones. Of the species tested, *Aedes* (*Stegomyia*) *luteocephalus*, Newst., *A. (S.) apicoargenteus*, Theo., and *A. (Aedimorphus) apicoannulatus*, Edw., breed commonly in tree-holes and other small collections of water around habitations, and their eggs apparently have a high resistance to desiccation, retaining their fertility throughout the dry season. *Eretmopodites chrysogaster*, Graham, breeds in tins and in small collections of water at the bases of leaves of various plants, but not apparently in rot holes in trees. *A. luteocephalus* fed readily on both man and various laboratory animals in daylight, *A. apicoannulatus* fed readily on man in daylight, but less readily on monkeys, and *A. apicoargenteus* fed in daylight, in artificial light and in the dark, but did not bite either man or monkeys very readily; none of these three species could be induced to oviposit.

E. chrysogaster fed readily on man, both by day and at night, inflicting a painful bite; monkeys were less readily attacked. This species engorges in a very short time and ingests a large amount of blood, which is apparently very rapidly digested, the females being ready for another meal in 24 hours. Mating takes place before each oviposition, and no eggs were laid by females that had been segregated from males. Females placed in a cage with a clay pot containing water and a few old mango leaves laid eggs at frequent intervals, mainly in twos and threes on the side of the pot at the margin of the water. The eggs sank to the bottom and hatched within 24 hours; eggs removed from the water and kept dry for four days failed to hatch. Under favourable conditions, the larval stage lasted 7-10 days; the larvae feed mainly on decaying vegetable matter, but attack each other when food is scarce; they rest mostly on the bottom and come to the surface to breathe only at long intervals. Males emerge about three days earlier than females.

Batches of *Aedes luteocephalus* transmitted yellow fever from infected to healthy monkeys after intervals of 15–53 days in each of six cases, in the last of which a fatal infection was produced by the bite of a single mosquito. Positive results were also obtained in each of four cases with batches of *A. apicoannulatus*, 18–31 days after the infective feed. Negative results were obtained with batches of *A. apicoargenteus* that had fed on infected monkeys, in four cases in which they were allowed to bite susceptible monkeys and in two cases in which emulsions of the mosquitos were injected. Mosquitos of one batch of *Eretmopodites chrysogaster* produced typical infections, which developed after a long incubation period, in two monkeys that they were allowed to bite, 16 and 20 days respectively after an infective feed; those of another batch caused no reaction in any of four susceptible monkeys 12–24 days after an infective feed, but an emulsion of six of these, made 24 days after the infective feed, produced a fatal infection. It therefore seems that although the virus of yellow fever may be present in some part of the body of *E. chrysogaster*, it does not always reach the salivary glands. As the eggs of this species do not withstand desiccation, it must breed only in places where there is a constant supply of water, and be comparatively seldom found near habitations, so that it would seem to be of little practical importance unless there is a reservoir for the virus in some wild animal. Since little is known of the habits, flight radius, distribution and prevalence of the tree-breeding species of *Aedes*, it is difficult to estimate the part that they play in the spread of yellow fever. The virus was apparently not modified, nor its virulence attenuated, by passage through *A. luteocephalus*, *A. apicoannulatus* or *E. chrysogaster*.

Aedes (Finlaya) longipalpis, Grünb., and *A. (F.) wellmani*, Theo., which breed freely in tree-holes in the forest, and more rarely close to habitations, and *Culex (Culiciomyia) nebulosus*, Theo., which is, next to *Aedes (Stegomyia) argenteus*, Poir. (*aegypti*, L.), the commonest domestic mosquito at Lagos, and breeds in pools, drainage canals, tree-holes, water-pots and many kinds of receptacles, refused to bite monkeys and other laboratory animals, and could only rarely be induced to bite man.

KLIGLER (I. J.). **Attempts to infect *Aedes aegypti* (*Stegomyia fasciata*) of West Africa with *Leptospira icteroides* by feeding on infected Guinea-pigs and on Culture Suspensions.**—*Amer. J. Trop. Med.*, viii, no. 4, pp. 283–297, 2 refs. Baltimore, Md., July 1928.

Experiments, the technique of which is described, were carried out at Lagos to determine whether females of *Aedes argenteus*, Poir. (*aegypti*, L.) bred from larvae obtained locally could infect guineapigs with *Leptospira icteroides* after being fed either on infected guineapigs or on cultures of the spirochaete. The results of all the experiments were negative, whether the mosquitos were allowed to bite or emulsions of them were injected. Mosquitos dissected within six hours of feeding on blood suspension cultures contained large numbers of actively motile *Leptospira* in the gut, but after six hours the number of living forms rapidly diminished, and only a few active and many immobile forms were seen after ten hours, while repeated dissections of mosquitos 16 hours to two weeks after feeding failed to reveal *Leptospira* in the gut, Malpighian tubules, oesophagus or salivary glands.

The author points out that the above results are essentially similar to those obtained with a more virulent form of the same strain of *L. icteroides*, and with *A. argenteus* from Cuba, by Gay and Sellards [*R.A.E.*, B, xvi, 62], while he himself, in collaboration with Ashner, has obtained identical results with the strain of *L. icteroides* used in West Africa and with *A. argenteus* from Palestine. He considers that the cumulative evidence indicates that *A. argenteus* is not the intermediate host of *L. icteroides*, in spite of Noguchi's results [*R.A.E.*, B, viii, 78], but he suggests that occasionally some spirochaetes may survive in the mosquito, and that if the strain is a virulent one, they may produce infection.

SELLARDS (A. W.) & SILER (J. F.). **The Occurrence of *Rickettsia* in Mosquitoes (*Aedes aegypti*) infected with the Virus of Dengue Fever.**—*Amer. J. Trop. Med.*, viii, no. 4, pp. 299–304, 4 figs., 4 refs. Baltimore, Md., July 1928.

The authors record the occurrence of *Rickettsia* in the hind gut of specimens of *Aedes argenteus*, Poir. (*aegypti*, L.) from batches that had transmitted dengue from man to man in the Philippines. Masses of the organism, which are illustrated, occurred in the lumen, and smaller numbers were found in the epithelial cells; they occurred in about half of the individuals of batches known to be infected with the virus of dengue, but were not found in any mosquitos known to be uninfected. A protozoon resembling *Lankesteria culicis* occurred in some of the uninfected mosquitos.

ST. JOHN (J. H.). **The Gametocytes of Tertian Malaria and their early Appearance in Malaria transmitted by *Anopheles punctipennis*.**—*Amer. J. Trop. Med.*, viii, no. 4, pp. 305–323, 1 pl., 3 charts, 5 refs. Baltimore, Md., July 1928.

The following is taken from the author's summary: Tertian malaria (*Plasmodium vivax*) was transmitted by *Anopheles punctipennis*, Say, in six of nine attempts; the incubation period varied from 14 to 31 days. That gametocytes are present early in the course of tertian malaria initiated by mosquitos was shown by the successful infection of *A. punctipennis* on two different cases of malaria on the fourth day following the onset of the infections. This emphasises the necessity for screening all cases of tertian malaria from the beginning of the disease.

SHIOZAWA (S.) & ANJOW (S.). **Zur Frage der Infektion von *Leptospira icteroides*, *icterohaemorrhagiae* und *hebdomadis* durch Mückenübertragung.** [The Problem of Transmission of *L. icteroides*, *L. icterohaemorrhagiae* and *L. hebdomadis* by Mosquitos.]—*Proc. Imp. Acad.*, iv, no. 5, pp. 248–251. Tokyo, May 1928.

The authors attempted to transmit *Leptospira icteroides*, *L. icterohaemorrhagiae* and *L. hebdomadis* from infected guineapigs to healthy ones, using *Aedes argenteus*, Poir., as the vector, the strains of *Leptospira* employed being in every case highly virulent when inoculated directly into guineapigs. The mosquitos, which were obtained from Formosa, were kept at a temperature of 20–31°C. (68–87·8°F.). The experiments were carried out from November 1925 to September 1926, the mosquitos being allowed to bite healthy

guineapigs 3-16 days after biting infected ones. In no case was there a trace of infection in the healthy animals. The same result was obtained when an emulsion of infected mosquitos was injected both subcutaneously and intraperitoneally.

KLIGLER (I. J.). **Studies on the Etiology of Phlebotomus and Dengue Fever. I. Introduction.**—*Ann. Trop. Med. Parasit.*, xxii, no. 2, pp. 143-150, 11 refs. Liverpool, 28th August 1928.

In Palestine, the epidemic season of sandfly fever extends from May to October (when *Phlebotomus papatasi*, Scop., is prevalent), with two peaks, the major in June and July, the other in September. Cases occur about 7-10 days after the time of appearance of the first sandflies, which varies in different localities according to temperature. In Jericho, the first brood hatches early in April; in Jerusalem, early in May; in Haifa, at the end of April. With the disappearance of the sandflies, cases of the fever promptly disappear.

An epidemic of dengue occurred at Haifa about 20th October 1927, when sandflies had practically disappeared, and *Aedes argenteus*, Poir. (*aegypti*, L.) was active; it reached its height in the middle of November, and continued until early in December.

The two diseases, though closely related, are apparently distinct, differences occurring in the mode of transmission, duration of the illness (3 days in the former, 6 in the latter), severity of symptoms, and immunology. The relation of *Leptospira* to these diseases is considered, and attention is called to the failure of the author to detect this organism in cases of sandfly fever or to transmit the disease to guineapigs.

KLIGLER (I. J.) & ASHNER (M.). **Studies on the Etiology of Phlebotomus and Dengue Fever. II. Is a *Leptospira* the causative Virus?**—*Ann. Trop. Med. Parasit.*, xxii, no. 2, pp. 151-159, 12 refs. Liverpool, 28th August 1928.

Experiments, the technique of which is described, were carried out to determine the relation, if any, of *Leptospira* to sandfly and dengue fevers. Blood was taken, during the first day of the disease, from 18 patients with sandfly fever and, during the second day, from 9 with dengue. In no case could *Leptospira* be cultivated or detected.

Further studies failed to reveal the presence of *Leptospira* in numerous sandflies (*Phlebotomus papatasi*, Scop.) either from infected houses or fed on infected persons. No organism of any kind could be found in individual dissections of the stomach and glands of 140 examples of *Aedes (Stegomyia) argenteus*, Poir. (*aegypti*, L.) from the same infected houses.

In West Africa, *Leptospira icteroides* was found to survive in *Aedes argenteus* for only 12-16 hours [*R.A.E.*, B, xvi, 236]. In Palestine its survival time in this mosquito is the same, but in *Phlebotomus papatasi*, Scop., it is 36-48 hours.

[DRYENSKI (P.) & DRYENSKI (K.). Дрънски (П.) и Дрънски (К.). **Contribution to the Study of *Phlebotomus* (Dipt.) and Three-day Fever in Bulgaria.** [In Bulgarian.]-*Mitt. bulgar. ent. Ges.*, iv, (1927), pp. 31-56, 4 figs., 24 refs. Sofia, 1928. (With a Summary in German.)

The results of observations on *Phlebotomus* in Bulgaria are reviewed in detail, and keys are given to the four species occurring there, viz.,

P. papatasi, Scop., *P. minutus*, Rond., *P. sergenti*, Parrot, and *P. perniciosus*, Newst. Their morphology, biology and distribution, and the epidemiology and control of sandfly (three-day) fever are discussed.

ROUBAUD (E.). **Asthénobiose et hibernation obligatoire provoquées, chez *Phlebotomus papatasi* Scop.**—*Bull. Soc. Path. exot.*, xxi, no. 6, pp. 436-439, 1 ref. Paris, 1928.

Further experiments on the bionomics of *Phlebotomus papatasi*, Scop. [*R.A.E.*, B, xvi, 171, 183] have shown that the production of larvae that develop slowly or rapidly is dependent on the length of time that elapses between taking the blood meal and the deposition of the eggs. Females ovipositing in less than six days give rise to active larvae that develop in about thirty days at 28° C. [82.4° F.], while females ovipositing after a longer period produce larvae that develop slowly and show a diapause in the fourth instar. That this retarded development is not as a rule due to physiological defects in the females was proved by a further series of experiments in which oviposition was artificially delayed by unnatural surroundings. The larvae produced were all of the inactive type. Apart from the fact that their growth is exceptionally slow and that their development is arrested in the fourth instar, the larvae die without completing their development unless they hibernate or pass through a long period at a temperature lower than that at which they are normally active, which is the only physiological means of reactivation. These findings can be adapted to experimental rearing, and larvae can be maintained in a latent state and reactivated when required.

MATHIS (C.). **Identité, à Dakar, du spirochète des rats, du spirochète de la musaraigne et du spirochète récurrent humain.**—*Bull. Soc. Path. exot.*, xxi, no. 6, pp. 472-485, 24 refs. Paris, 1928.

Transmission experiments and cross immunity tests show that the spirochaetes found in man, rats and mice at Dakar are apparently identical with *Spirochaeta crocidurae*. It therefore follows that rats and mice as well as the shrew *Crocidura stampfli* are reservoirs of the virus of human relapsing fever. Infections are common in small mammals and only occasional in man.

Report of Bureau of Malaria Control 1926-27.—*Porto Rico Rev. Publ. Hlth. Trop. Med.*, iii, no. 7, pp. 279-286. San Juan, P.R., 1928.] (Abstract in *Publ. Hlth. Rpts.*, xliii, no. 30, pp. 1992-1993. Washington, D.C., 27th July 1928.)

The annual rainfall in Porto Rico does not exceed 25 inches, but this may be concentrated and thus favour the breeding of *Anopheles albimanus*, Wied., the important vector of malaria. Irrigation is practised throughout the year, the areas most difficult to deal with being the lowlands near the sea, which are dry except after heavy rains, when they are wet for several months. The reservoirs and seepage areas are treated weekly with Paris green.

DYAR (H. G.). **Water-bearing Plants of Panama which harbor Mosquitoes, with a new Species of *Wyeomyia* (Diptera : Culicidae).**—*Proc. Ent. Soc. Wash.*, xxx, no. 6, pp. 110–112. Washington, D.C., 18th July 1928.

This is a list of the genera of plants occurring in the Panama Canal Zone that hold water in their leaves or bracts, with notes on the mosquitos that breed in them. These mosquitos comprise *Anopheles cruzi*, D. & K., 18 Sabethines, 3 Culicines and *Megarhinus superbus*, D. & K.; the larvae of the latter prey on those of *A. cruzi* and other species found in the same plants. The adults of all these frequent their special plants and never occur in large numbers, although some occasionally enter houses.

DAVIS (N. C.). **A Consideration of Variability in the *Nyssorhynchus* Group of the Genus *Anopheles*.**—*Amer. J. Hyg.*, viii, no. 4, pp. 539–563, 3 figs., 5 graphs, 7 refs. Baltimore, Md., July 1928.

Statistical data are presented to illustrate the range of variability in costal markings and in the percentage of black on the second segment of the hind tarsus of the adults of the *Nyssorhynchus* group of *Anopheles* in Brazil and Argentina. In general, the last criterion is considered to be very valuable in differentiating similar species. It is suggested that melanism is correlated not only progressively with the distance from the Equator, as stated by Root, but also with the seasons, being more marked during the colder months. The tendency to variation and mutation accounts for the occurrence of certain species with a restricted range and suggests that other species are in process of differentiation.

Adults were reared from eggs laid by isolated females; the young in all cases had the same characters as the mother, and varied less among themselves than miscellaneous collections of the same species.

It is suggested that *Anopheles rooti*, Brèthes, from northern Argentina, should be considered a variety of the Brazilian *A. argyritarsis*, R.-D., and *A. evansi*, Brèthes, a synonym, or possibly a variety, of *A. tarsimaculatus*, Goeldi. *A. strodei*, Root, which replaces *A. tarsimaculatus* in parts of Brazil [*R.A.E.*, B, xiv, 199], may be only a variety of this species, as individuals resembling it occur in northern Argentina, where the true *A. tarsimaculatus*, of which they may be mere variants, predominates.

A. argyritarsis is occasionally taken in houses, but it is not truly domestic in any of the areas studied in Brazil and Argentina. *A. albitarsis*, Arrib., is domestic in Brazil, but much less so in north-western Argentina, while *A. tarsimaculatus* is less domestic in Argentina than in its northern range. *A. bachmanni*, Petrocchi, has been taken in considerable numbers in a hospital in north-eastern Argentina, and *A. rondoni*, Neiva & Pinto, has been found in houses on numerous occasions.

SERGEANT (Edm. & Et.), PARROT (L.), FOLEY (H.), CATANEI (A.) & SENEVET (G.). **Etudes épidémiologiques et prophylactiques du paludisme, 23e, 24e at 25e campagnes en Algérie en 1924, 1925 et 1926.**—*Ann. Inst. Pasteur*, xlii, no. 7, pp. 782–790. Paris, July 1928.

A brief account is given of the investigations on malaria and the measures carried out against it in Algeria from 1924 to 1926. The

incidence of the disease was comparatively low in each of these years on account of the unusually dry summers, although in a few cases the reduced flow of streams resulted in the pools along their beds being more numerous than usual. Marchoux has suggested [*R.A.E.*, B, xiii, 138] that in countries with mild winters, such as Algeria, *Anopheles maculipennis*, Mg.] hibernates not only as an adult but also in the egg stage. Although hibernating females are scarce in Algeria, it is unnecessary to suppose that eggs survive the winter, in explanation of the abundance of larvae in the spring; moreover, in most of the malarious localities the Anopheline breeding-places are pools in the beds of streams that become torrents in the winter, in which it would be impossible for eggs to remain.

SYMES (C. B.). Notes on Anophelines and Malaria in Kenya.—*Kenya & E. Afr. Med. J.*, v, no. 5, pp. 138–183, 9 tables. Nairobi, August 1928.

This is a full account of the results of studies of Anophelines during the period of abnormally high incidence of malaria in Kenya from March 1926 to April 1927. Much of the information has already been briefly recorded [*R.A.E.*, B, xvi, 126].

An attempt has been made to correlate mosquito findings with malaria incidence and climatic factors in the different localities. Conditions required for breeding by the majority of the species dealt with are discussed. In Nairobi most of them develop under conditions far removed from the optimum as regards shade, cleanliness and movement of water. *Anopheles gambiae*, Giles (*costalis*, Theo.) and *A. christyi*, N. & C., though breeding most intensively in the stagnant, open and dirty water of borrow-pits, are also common in the more or less dirty and slowly moving waters along the grassy edges of streams. Many other factors must, however, be determined for each breeding ground before its suitability for any species can be explained. *A. funestus*, Giles, which occurs in fresh running water may possibly require a relatively high oxygen content, *A. gambiae* a moderate one, whilst *A. christyi*, which reaches its breeding maxima in the filthiest borrow-pits, may be directly influenced by albuminoid ammonia. In several districts there are streams in which Anopheline larvae are never found, some containing brownish-red flocculent material consisting of ferric hydroxide and others an iridescent film like that of oil.

In different districts the reclamation of grassy or swampy areas has resulted in an increase in the numbers and varieties of species, present methods of agricultural development also contributing enormously to this.

A. implexus, Theo., is a new record for Kenya, being taken in a small, somewhat dirty, running stream that was covered with débris and shaded.

WEHRLE (W. O.). Das Gelbfieber in Liberia 1925 und 1927. [Yellow Fever in Liberia 1925 and 1927.]—*Arch. Schiffs- u. Tropenhyg.*, xxxii, no. 8, pp. 401–406. Leipzig, August 1928.

Up to 1925 Liberia was thought to be free from yellow fever, though the disease is, in fact, endemic there. *Aedes (Stegomyia) argenteus*, Poir. occurs everywhere, particularly at the beginning and end of the rainy season, April–May and October–November.

WEIDLING (K.). Die Beeinflussung von Eiröhrenzahl und -grösse einiger Dipteren durch Hunger im Larvalstadium mit einigen Beobachtungen über die Chaetotaxis der Hungertiere und über den Einfluss verschiedener physikalischer und chemischer Einwirkungen auf den Entwicklungsgang dieser Tiere (*Calliphora erythrocephala*, *Stegomyia fasciata* und *Anopheles maculipennis*). [The Effect of Hunger in the Larval Stage on the Number and Size of the Egg-tubes in some Diptera, with some Observations on the Chaetotaxy of Starved Individuals and on the Effect of various physical and chemical Factors on the Course of their Development.]—*Z. angew. Ent.*, xiv, no. 1, pp. 69–85, 5 figs., 18 refs. Berlin, July 1928.

The following is taken from the author's summary: Hunger materially prolongs the duration of development of *Calliphora erythrocephala*, Mg., *Aedes argenteus*, Poir. (*Stegomyia fasciata*, F.) and *Anopheles maculipennis*, Mg. Starved insects do not attain normal size, have fewer egg-tubes and deposit fewer eggs. In *Calliphora*, small, starved insects lay eggs of normal size; in *Aedes*, the eggs are slightly smaller than normal. In both species the adults obtained with good feeding were not distinguishable from normal ones. While technical difficulties did not permit similar experiments with *A. maculipennis*, this supports the view that the large and small forms of *A. maculipennis* in Holland, which retain the difference in size in the following generation [*R.A.E.*, B, xv, 145, etc.], are true races. The size of individuals has an influence on the number of bristles of mosquitos and flies. Caution is therefore necessary in treating them as an important character in classification. On an average the males emerged a little before the females. Batches of starved larvae often yielded many more males than females; this may be due to a heavier mortality from starvation in the latter. Strong light hinders the development of *Calliphora*.

SWELLENGREBEL (N. H.), DE BUCK (A.) & SCHOUTE (E.). Over anophelisme zonder malaria in de omgeving van Amsterdam. (Tweede mededeeling.) [On Anophelism without Malaria round Amsterdam. Second Communication.]—*Verh. Kon. Akad. Wetensch. Amst.*, Afd. Natuurk., xxxvii, no. 4, pp. 386–394, 5 maps. Amsterdam, 1928.

South of Amsterdam there is an area divided into a northern region (I), where malaria occurs, and a southern region (II), where it is absent or rare. In I there is a small type of *Anopheles maculipennis*, Mg., with a larger number of maxillary teeth, while in II there is a large type with fewer teeth [*R.A.E.*, B, xv, 21, 145]. The continued investigations here described showed that while the statement that the short-winged race predominates in I can be largely maintained, a mixture of both races occurs everywhere in II. This mixture is shown very distinctly in winter. One group of mosquitos, living in stables, is similar to the type of region I. They do not hibernate completely, but feed under favourable circumstances, and the fat-body in them does not develop. The other occurs in uninhabited sheds, barns, attics, etc. It is long-winged, has a developed fat-body (at least at the beginning of autumn) and does not feed. In region I the mosquito population is fairly pure.

In region II mosquitos are common in dwellings, in spring and autumn even more so than in I. Preliminary precipitin-tests in I and II did not show any great difference in the appetite for human blood. In II, however, the mosquitos visiting houses in winter are seeking shelter and hibernate completely. In I the mosquitos visiting houses do not hibernate completely, so that malarial infection is favoured. This does not account for the absence of summer infections in II, but this may be explained by the comparatively low local abundance of *A. maculipennis* there. In exceptional localities the mosquitos, though abundant, are of the long-winged type. The low mosquito abundance in II seems to depend on factors connected with the breeding-places. The larvae in II seemed more restricted to the use for food of green algae and flagellates, and the development of the short-winged race seemed to be hindered by fresh water.

SWELLENGREBEL (N. H.). **Eine Vergleichung der Aenderungen, welche die jährlichen Zahlen der Malariakranken und Anophelen in den letzten Jahren in der Umgebung Amsterdams aufwiesen.** [A Comparison of the Changes shown by the annual Figures of Malaria Cases and *Anopheles* in recent Years in the Neighbourhood of Amsterdam.]—*Abh. Gebiete Auslandsk. Hamburgische Univ.*, xxvi, Ser. D. (Med.), ii (Festschr. Nocht), pp. 542-546. Hamburg, 1927.

Beginning in the last years of the malarial epidemic that occurred around Amsterdam in 1918-22, regular counts have been made of *Anopheles maculipennis*, Mg., in dwellings and stables. The results show that the decrease of malaria since the epidemic has not coincided with an important decrease of the Anopheline population, but that there is a certain, though not chronologically perfect, connection with a relatively much greater decrease in the number of Anophelines in dwellings.

APFELBECK (N.). **Beiträge zur Kenntnis wenig bekannter Stechmücken (Dipt., Culicidae).** 1. *Theobaldia glaphyoptera*, Schiner. — *N. Beitr. syst. Insektenk.*, iv, no. 3-4, pp. 28-31, 5 figs. Berlin, 25th July 1928.

Some details are given of the larval morphology and male genitalia of *Theobaldia glaphyoptera*, Schiner, together with notes on its distribution.

[ZAIKIN (N. S.). **Зайкин (Н. С.). A Study of the Biology of the Malaria Mosquito in Penza.** In Russian. — *Russ. J. Trop. Med.*, vi, no. 5, pp. 290-292, 1 ref. Moscow, 1928.

This is a short account of the seasonal history of *Anopheles maculipennis*, Meig., as observed in Penza during the winter of 1924-25.

The degree of dormancy of the mosquitos depends on the temperature conditions in their hibernating quarters. The numbers found in cattle sheds rose in spring as the atmospheric temperature and the need for a blood meal prior to oviposition increased.

[KHARAZOV (T. G.). **Харазов (Т. Г.). On the Question of Malaria Control in Transcaucasia.** [In Russian.]—*Russ. J. Trop. Med.*, vi, no. 5, pp. 306–321. Moscow, 1928.

This is a general account of the topography of Transcaucasia with particular reference to malaria and its control. The need for co-operation throughout the entire area in organising drainage and cultural measures is emphasised.

MARTINI (E.). **Malaria und Malariabekämpfung in der Türkei.** [Malaria and Malaria Control in Turkey.]—*Seuchenebekämpfung*, 1928, no. 1–2, reprint 8 pp. Vienna, 1928.

Notes are given on the mosquitos of Asiatic Turkey [cf. *R.A.E.*, B, xvi, 175], and the anti-malaria law of 1926 is reproduced. It includes clauses providing for the prevention and control of mosquito breeding.

BLANK-WEISSBERG (S.). **Die Bekämpfung des Anophelismus in Polen im Jahre 1927.** [The Control of Anophelines in Poland in 1927.]—*Polsk. Pismo ent.*, vi, no. 3–4, pp. 237–248, 1 fig., 1 pl., 2 refs. Lemberg, 1928.

The use of Paris green for the control of Anophelines in Poland is described. The dust was used at the average rate of 0.06–0.08 gm. to the square metre of water surface. Although this is very much less than the amount used by Hackett [*R.A.E.*, B, xiv, 17], all the larvae of the second instar and older were killed. Paris green does not affect first instar larvae as their mouth-parts are too small to swallow particles of the dust. Dusting was begun in the middle of May and continued at fortnightly intervals till September. Larvae were found from the middle of April to the beginning of October. The most favourable plants for the development of *Anopheles maculipennis*, Mg., are those the leaves of which are immediately under the surface of the water, such as *Lemna triscula*. The leaves of *L. minor*, which float on the surface, interfere with the breathing of the larvae, and no Anophelines are found in water covered with them. The larvae of *A. maculipennis* do not live in waters where there are no plants, nor in turbid or running water, while *Culex pipiens*, L., breeds almost anywhere, though seldom in clean water. Shortly after the destruction of Anopheline larvae, those of *Culex* appear in the treated water. In the swamp areas Anophelines were found in all places covered with reeds, especially *Carex* and *Juncus*. *Culex* larvae did not occur at all. The application of Paris green in this region is described, and the necessity of applying the dust in future by means of aeroplanes is pointed out.

VALLE (V.). **Relazione della campagna antimalarica 1926–1927.** [Report on anti-malarial Work in Venetia in 1926 and 1927.]—*Riv. Malariol.*, vii, no. 2, pp. 104–140, 7 figs. Rome, 1928. (With Summaries in Italian, p. 210, French, p. 212, English, p. 214, German, p. 216.)

Winter work in animal quarters against adult mosquitos, represented by large numbers of *Anopheles maculipennis*, Mg. (*claviger*, auct.) and a few specimens of *A. sacharovi*, Favr (*elutus*, Edw.) and *A. algeriensis*,

Theo., consisted of spraying with a creosote preparation, which gave good results. In work against the larvae in summer, investigations on Paris green showed that they try to swallow everything on the surface of the water and occasionally ingest particles of the poison. The first instar larvae are not able to swallow the particles of a fine Paris green dust, and the second instar larvae cannot swallow a coarse dust. As the poison is present in the water for only a short time, it cannot kill these larvae when they have become larger. Dusting must, therefore, be repeated at intervals of not more than 8 days, which makes the cost approximate to that of oiling. In some cases work against the adults was done in summer, and electrical fans proved of value. Larvicidal fish, *Gambusia* and another species [*Alburnus lucidus*], were distributed. They can destroy up to 20 per cent. of the larvae. Instead of prohibiting fishing in waters stocked with larvicidal fish, the use of nets of large mesh would be preferable as they would capture the larger fish, such as pike, that prey on the small ones. In the province of Rovigo a cat-fish, *Amiurus nebulosus*, imported from Japan to check the pike, has cleared the waters of nearly all fish and renders difficult the use of larvicidal species.

PECORI (G.) & ESCALAR (G.). **Relazione sulla campagna antimalarica [del Governatorato di Roma] nell'anno 1927.** [Report on the anti-malarial Campaign in 1927 in the Government District of Rome.]—*Riv. Malariol.*, vii, no. 3, pp. 217-266, 1 map. Rome, 1928. (With Summaries in Italian, p. 396, French, p. 400, English, p. 404, German, p. 408.)

Work against mosquito larvae included oiling and dusting with Paris green. In warm weather dusting was repeated every 8 days, but if the larvae had not reached the third instar, it was delayed, as the smaller larvae cannot ingest the poison. The work continued from mid-April, when males of *Anopheles maculipennis* were first found, until November, the last male being captured on the 21st. Larvae of *A. maculipennis* were always most numerous in stagnant water close to dwellings, and their control should extend to a radius of $\frac{3}{4}$ mile. The capture of the adults in dwellings, etc., especially in October and November when there is the highest percentage of infected mosquitos, is a valuable measure. On a stormy October day about a hundred mosquitos were captured in a pig-sty; two hours later a further hundred were taken in the same place, proving that in bad weather in autumn mosquitos seek shelter of this type.

STRICKLAND (C.), CHOWDHURY (K. L.) & others. **Abridged Report on Malaria in the Assam Tea Gardens.**—8vo, iv+128 pp., 3 pls., 26 figs., 26 refs. Calcutta, Indian Tea Assoc. [1928.]

This report includes contributions by estate medical officers on malaria incidence in various localities, and a discussion of the periodic incidence of the disease and the responsibility of the terrain for its endemicity [cf. *R.A.E.*, B, xiv, 12]. A list of the various Anophelines occurring in Assam is given, and their relative importance is discussed; emphasis is laid on the importance of *Anopheles funestus*, Giles, and *A. aconitus*, Dön., and since they are found in large numbers on the grassy edges of streams, the canalisation of these streams, together with the growing of strips of jungle along their banks, is strongly recommended. It is

also the authors' opinion that efforts at the elimination of malaria need not be carried out over large areas, since the distribution of the disease is very local.

HANAFIN (J. B.). **Further Results in Mosquito Proofing Barracks.**—*J. Roy. Army Med. Corps*, li, no. 2, pp. 127–130, 1 chart. London, August 1928.

A further comparison of the numbers of malaria cases from screened and unscreened barracks confirms the results previously recorded [*R.A.E.*, B, xvi, 66]. Mosquito-proofing of buildings is considered the most suitable means of reducing the incidence of malaria among organised bodies of men such as troops.

THOMPSON (T. O.). **The Cantonment Antimalaria Problem.**—*J. Roy. Army Med. Corps*, li, no. 3, pp. 179–185. London, September 1928.

The author points out some of the difficulties encountered in carrying out measures against malaria in cantonments, particularly when the area involved is surrounded by country where no anti-malaria work is in progress. The following two spray formulae have been used successfully in a number of places: 65 per cent. paraffin, 32½ per cent. petrol, and 2½ per cent. citronella oil; or 70 per cent. paraffin, 20 per cent. petrol, 5 per cent. formalin, and 5 per cent. oil of wintergreen. A new method, which has been found both cheap and effective, is for one man to carry a bowl of strong soap solution and a stick to beat curtains, etc., and a second man to lather his hands repeatedly and pat the mosquitos as they fly out. Any mosquitos that touch the soap at once collapse into it.

IYENGAR (M. O. T.). **Mosquitoes in Relation to Disease.**—8vo, 16 pp., 9 figs. Calcutta, Govt. Bengal, Public Health Dept., 1928.

This is a popular account of the bionomics, the methods of control, and the collection and preservation of mosquitos in Bengal, together with a key for the identification of the females of common Bengal Anophelines. The mosquito-borne diseases of India are malaria, filariasis and dengue, the first two of which are discussed.

PATERSON (A. R.). **Notes on the Organization and Scope of certain Anti-malaria Work in the Federated Malay States with special Reference to the Control of Malaria in the Capital Town of Kuala Lumpur by Means of permanent Drainage.**—*Kenya & E. Afr. Med. J.*, v, no. 4, pp. 112–131, 2 refs. Nairobi, July 1928.

This account of malaria control work in the Federated Malay States includes a description of the methods of drainage that have been evolved for the prevention of mosquito breeding.

NAUCK (E. G.). **Epidemiologie und Tropenkrankheiten** [Tropical Diseases] **in China.**—*Beih. Arch. Schiffs- u. Tropenhyg.*, xxxii, no. 5, pp. 201–277, 15 pp. refs. Leipzig, 1928.

The predominant Anopheline throughout China is *Anopheles hyrcanus* var. *sinensis*, Wied., and it is probably the chief vector of malaria.

A. maculipennis, Mg., has been found in the north and extends southwards perhaps to Peking. It may possibly be the chief vector in north Manchuria and on the Amur. The other mosquitos found in southern China are Oriental species. Probably *A. (Myzomyia) subpictus*, Grassi (*rossi*, Giles), and *A. maculatus*, Theo., are vectors of malaria. It is not certain that rice-fields are really centres of malaria; the numerous larvae observed there by the author were probably Culicines. Melney's observations on breeding-places are quoted [*R.A.E.*, B, xv, 184; xvi, 42]. As regards hibernation in north China, Cazeneuve recorded in 1910 that all mosquitos in Shantung were killed by the intense cold, only the eggs remaining viable in the ice and hatching out in spring. This agrees with the occurrence of malaria, the first cases appearing in August. They increase until September–October and suddenly disappear with the advent of cold weather.

SENIOR-WHITE (R.). **Physical Factors in Mosquito Ecology. Part II.**—*Ind. J. Med. Res.*, xvi, no. 1, pp. 11–30, 2 pls., 2 figs., 20 refs. Calcutta, July 1928.

This paper contains the results of investigations on the ecology of mosquitos carried out, with a few exceptions, in the Indo-Gangetic Plain at Delhi, similar to those made in Ceylon [*R.A.E.*, B, xiv, 33] but extended to other factors as well as those previously measured. The methods of measuring the various factors are given, and the localities selected for routine investigation are described.

The following is largely taken from the author's conclusions: The specific determination of the plankton is necessary since generic identification has not yielded results of any value. The study of hydrogen-ion concentration, conductivity, carbonates and albuminoid ammonia in connection with mosquito breeding has proved useless, though the study of "residual pH," phosphates and dissolved oxygen may still yield valuable results. Saline ammonia is inhibitory to *Anopheles* breeding, except in the case of the group allied to *Anopheles subpictus*, Grassi (*rossi*, Giles), in amounts exceeding 1 part in a million, and the evaluation of nitrite and nitrite factors are required to correlate with the saline ammonia values. The Winkler process for measuring dissolved oxygen is useless in the presence of nitrites and must therefore be modified for use in these cases. The author was unable to confirm the values for optimum and limiting temperatures in *Anopheles* breeding given by Hodgson and King, who state that the optimum temperature lies between 68–78° F. (20–26° C.), whilst temperatures of 94–104° F. (35–40° C.) are rapidly fatal. Different species are shown to have different optima, and *Anopheles stephensi*, List., and *A. fuliginosus*, Giles, were found apparently breeding without restraint at temperatures up to 18° F. (10° C.) higher than the optimum figure of 78° F. The confirmation of the discovery of the inhibitory effect of very small amounts of ammonia opens up practical possibilities of control.

CHOWDHURY (K. L.). **The Larva of *A. jeyporiensis* James.**—*Ind. J. Med. Res.*, xvi, no. 1, pp. 38–40, 1 pl., 3 refs. Calcutta, July 1928.

The larva of *Anopheles jeyporiensis*, James, is re-described and figured, and a table is given showing the characters distinguishing the larvae of this species, *A. aconitus*, Dön., and *A. philippinensis*, Ludl.

CHOWDHURY (K. L.). **A Note on the Larva of *Anopheles philippinensis*, Ludlow, 1901, and its Diagnosis.**—*Ind. J. Med. Res.*, xvi, no. 1, pp. 41–44, 1 pl., 3 refs. Calcutta, July 1928.

The larva of *Anopheles philippinensis*, Ludl., is described, and the characters distinguishing the larvae of this species, *A. fuliginosus*, Giles, *A. jamesi*, Theo., *A. pseudojamesi*, Strick. & Chwd., and *A. maculipalpis*, Theo., are tabulated. The author points out that the larva of *A. pallidus*, Theo., differs from that of *A. philippinensis* only in the form of the abdominal palmate hair.

SUR (P.). ***Anopheles philippinensis* as a Natural Carrier of the Malaria Parasites in Bengal.**—*Ind. J. Med. Res.*, xvi, no. 1, pp. 45–47, 5 refs. Calcutta, July 1928.

Anopheles philippinensis, Ludl., is widely distributed in Bengal, the scarcity of previous records being explained by the possibility of its having been confused with *A. pallidus*, Theo., and *A. fuliginosus*, Giles. The characters by which these species may be distinguished are quoted. Individuals naturally infected with malarial parasites, both zygotes and sporozoites, were collected in one region. The average rate of infection for the months of October and November was 3·1 per cent., the high figure being probably due to the high rate of malaria infection in the villages from which the specimens were collected.

SINGH PRUTHI (H.). **Some Insect and other Enemies of Mosquito Larvae.**—*Ind. J. Med. Res.*, xvi, no. 1, pp. 153–157, 2 refs. Calcutta, July 1928.

Details are given of the predacious enemies of mosquito larvae in the vicinity of Calcutta, including various aquatic bugs, Dytiscid and Gyrinid beetles, and dragonfly larvae.

SINTON (J. A.). **Notes on some Indian Species of the Genus *Phlebotomus*. Part xxiii. *Phlebotomus clydei* n. sp.**—*Ind. J. Med. Res.*, xvi, no. 1, pp. 179–186, 2 pls., 3 refs. Calcutta, July 1928.

Both sexes of *Phlebotomus clydei*, sp. n., are described from India. A re-examination of the type of *P. babu*, Annan., 1910, has shown that it is not identical with the European *P. minutus*, Rond. The former and its variety, *niger*, Annan., are the sandflies that have commonly been identified in India in the past as *P. minutus* and *P. minutus* var. In India the true *P. minutus* seems to be confined to the western areas of the country, while *P. minutus* var. *antennatus* Newst., is much more widely spread.

KORKE (V. T.). **Observations on Filariasis in some Areas in British India. Parts I & II.**—*Ind. J. Med. Res.*, xiv, no. 3, pp. 717–732, 1 pl., 9 refs.; xvi, no. 1, pp. 187–198, 1 pl., 2 figs., 2 refs. Calcutta, January 1927 & July 1928.

An account is given in the second part of this paper of an investigation on filariasis carried out in Bihar and Orissa, where it was found to be uniformly prevalent in cultivated areas, chiefly those under rice. The predominant parasite was *Filaria (Microfilaria) bancrofti*, which was

studied both in man and in the mosquito. On an average 14 per cent. of the mosquitos were found infected in nature, 15 per cent. of *Culex fatigans*, Wied., the prevalent species of mosquito in the Gaya region and 12 per cent. of the mosquitos in the Puri region (also suspected to be *Culex fatigans*) showing developmental stages of the parasite. In the mosquito the parasite was first found in the stomach and showed characters identical with those found in man. It is presumed that the casting of the sheath commenced soon after the ingestion of the blood by the mosquito. The second form, which was a cylindrical and sausage-shaped body with the remnant of a tail, and the third form, which was a long, slender body, were both found in the thoracic muscles. The first forms without the sheath were observed after a few hours and after the 1st, 2nd and 5th days of captivity of the mosquitos. The second forms were observed after a few hours and up to the 14th day and the third form after the 3rd day.

The following method of keeping the mosquitos alive, suggested by P. J. Barraud, was found to be satisfactory. They were placed in a hurricane lamp glass, the top and bottom of which were covered with mosquito netting. This was placed in a shallow box on several thicknesses of white lint, which was kept damp. A piece of damp, folded white lint about an inch wide and some split dates, slices of banana or raisins were placed on the netting covering the top of the lamp glass, in such a way as not to exclude the air. Fruit and mosquito netting should be renewed if they become mouldy. The mosquitos may require to be kept cool in hot weather.

SHORTT (H. E.), CRAIGHEAD (A. C.) & SWAMINATH (C. S.). **A brief Résumé of recent Kala-azar Research with special Reference to India.**—*Ind. J. Med. Res.*, xvi, no. 1, pp. 221–238, 2 pls., 51 refs. Calcutta, July 1928.

The history of the work that has been done on kala-azar is reviewed, including the relation of *Phlebotomus argentipes*, Annan. & Brun., to this disease. Further experiments in this connection are now in progress.

SHORTT (H. E.), D'SILVA (H. A. H.) & SWAMINATH (C. S.). **Note on Dermal Leishmanoid.**—*Ind. J. Med. Res.*, xvi, no. 1, pp. 239–240, 1 ref. Calcutta, July 1928.

It has been thought that the parasite causing dermal leishmanoid was *Leishmania donovani* since a majority of the cases has given a definite previous history of kala-azar. In order to confirm this theory, *Phlebotomus argentipes*, Annan. & Brun., was fed on the lesions of a case of dermal leishmanoid, and 4 of the 25 flies showed a heavy infection of flagellates, comparable in all respects to that obtained in flies fed on kala-azar cases.

SHORTT (H. E.) & SWAMINATH (C. S.). **Preliminary Note on three Species of Trypanosomidae.**—*Ind. J. Med. Res.*, xvi, no. 1, pp. 241–244, 5 refs. Calcutta, July 1928.

On two occasions typical atlagellate Leishman-Donovan bodies were found in the peripheral blood of a gecko (*Hemidactylus* sp.), and since cultures made from its liver gave an abundant growth of typical

flagellate forms, the transference of the parasite previously described as *Herpetomonas hemidactyli* to the genus *Leishmania* is apparently justified.

It has been suggested that the *Crithidia* found in *Phlebotomus babu*, Annan. (*minutus*, auct.) is the insect phase of *Trypanosoma hemidactyli* found in the internal organs of *Hemidactylus* sp. Experiments were therefore carried out with sandflies caught in nature and laboratory-bred sandflies fed on lizards showing a trypanosome in the peripheral blood. On dissection, a large proportion contained the typical crithidial forms found in naturally infected sandflies, and the conclusion can therefore be drawn that the crithidial infection seen in *P. babu* in Assam is actually a phase in the life-cycle of a trypanosome of *Hemidactylus* sp. The trypanosome seen in the gecko concerned in these experiments is, however, morphologically distinct from that figured in the original description of *T. hemidactyli*.

Owing to the resemblance between *Crithidia conorhini* in *Triatoma rubrofasciata*, DeG., and *Trypanosoma cruzi* in *Triatoma megista*, Burm., experiments were made to confirm the supposition that this parasite was also a phase in the life-cycle of a trypanosome. Parasites appeared in the peripheral blood of two white mice inoculated intraperitoneally with the gut contents of *T. rubrofasciata*, and since these mice belonged to a stock that has never shown any blood parasites, it is concluded that *C. conorhini* is also the insect phase of a trypanosome. In Assam the immature forms of all stages of *T. rubrofasciata* are most commonly found in the nests and boxes of pigeons kept by the villagers, and it is therefore possible that this trypanosome may be that recorded from pigeons. On the other hand, the close resemblance of *Trypanosoma cruzi* to *T. vespertilionis* indicates the possibility that a bat may be the vertebrate host. These findings strengthen the opinion that the genus *Crithidia* may be synonymous with *Trypanosoma*.

BOREL (E.). Contribution à l'étude des moustiques de l'Indochine.—*Arch. Inst. Pasteur Indochine*, no. 2, pp. 222–234, 3 pls., 10 refs. Saigon, October 1925.

Descriptions are given of the larvae and both sexes of the adults of the five common Anophelines of Cochin China, viz., *Anopheles vagus*, Dön., *A. barbirostris*, Wulp., *A. kochi*, Dön., *A. tessellatus*, Theo., and *A. fuliginosus*, Giles, with brief notes on their breeding-places.

BOREL (E.). Les moustiques de la Cochinchine et du Sud-Annam. *Arch. Inst. Pasteur Indochine*, no. 3–4 (1926), pp. 75–121, 19 pls., 1 fldg. table, 26 refs.; no. 7, pp. 75–106, 8 pls., 26 refs. Saigon, [1927 &] April 1928.

These are the first two parts of a detailed account of the mosquitos of Cochin China and South Annam. The first part contains keys to the subfamilies and to the Culicine genera, the latter being adapted from that given by Edwards [*R.A.E.*, B, x, 197], and descriptions of the larvae and adults and keys to the adults of the 16 species of *Culex* occurring in Cochin China, with brief notes on their breeding-places. The second part deals with the subgenus *Stegomyia* of the genus *Aedes*, the adults, and in most cases the larvae, of 10 species, including two new ones, being described, and a key being given.

The development of *Filaria bancrofti* in *Culex fatigans*, Wied., in Cochin China was followed by Le Chuiton, who erroneously recorded the mosquito as *C. pipiens*, L. [*R.A.E.*, B, xii, 126], a species that does not occur in Cochin China. The only other species dealt with that is of pathological importance is *Aedes* (*Stegomyia*) *argenteus*, Poir. (*fasciatus*, F.), which has been shown to be the intermediate host of *Filaria* (*Dirofilaria*) *repens* in dogs [*R.A.E.*, B, i, 57], and which is also the vector of dengue.

MORIN (H. G. S.) & PIROT (R.). **Sur l'épidémiologie de la dengue d'Extrême-Orient.**—*Arch. Inst. Pasteur Indochine*, no. 3-4 (1926), pp. 41-50, 40 refs. Saigon [1927].

An outbreak of dengue that occurred among the crew of a ship in the port of Saigon is discussed. No cases of the disease were known in the town, and the origin of the outbreak was traced to a man who had spent several days at a place some distance away. The interval between the first and the following cases (17 days), the subsequent rapid spread of infection and the clinical picture of the disease agreed in almost all points with the account given by Siler, Hall & Hitchens [*R.A.E.*, B, xiv, 124], which is summarised, and it is concluded that dengue in Indo-China is identical with that disease in the Philippines. Larvae and adults of *Aedes argenteus*, Poir. (*Stegomyia fasciata*, F.) were abundant in Saigon at the time of the outbreak.

MESNARD (J.). **Le typhus exanthématique au Tonkin.**—*Arch. Inst. Pasteur Indochine*, no. 7, pp. 3-19, 1 map, 12 graphs, 8 refs. Saigon, April 1928.

An account is given of an outbreak of typhus among prisoners in Hanoi from November 1926 to March 1927, and of a number of sporadic cases in other parts of Tonkin at all seasons of the year. That the disease was true exanthematic typhus is considered to have been proved both by inoculation of guineapigs and by serological tests with the Weil-Felix reaction, which are described. Numerous lice [*Pediculus*] were found on all the prisoners, and the outbreak came to an end as soon as their destruction had been completed. It is reasonable to suppose that lice are also responsible for the sporadic infections, as the poorer Annamese, amongst whom most of the cases occur, are frequently infested. It is concluded that exanthematic typhus is endemic in Tonkin and that outbreaks only occur under crowded and unhygienic conditions. The sporadic cases are mild and apparently only slightly infectious, and this may be explained by the fact that the natives are commonly infested with lice and consequently liable to infection from infancy.

IYENGAR (M. O. T.). **Infestations of the Human Intestines by Coprid Beetles in Bengal.**—*Ind. Med. Gaz.*, lxiii, no. 7, pp. 365-368, 1 pl., 11 refs. Calcutta, July 1928.

The occurrence of beetles in the stools of children, which has been previously noticed [*R.A.E.*, B, xii, 135, etc.], is discussed. The beetles have been identified from several localities as *Onthophagus bifasciatus*, Schall., *O. unifasciatus*, F., and *Caccobius mutans*, Sharp, descriptions of which are given. *O. bifasciatus* is the most common in northern

India ; it is nocturnal in habit and is attracted by lights inside houses. Records of the symptoms of the disease, which are described, are given, and the means by which insects gain access to the human intestines is discussed. It has been found that one child may pass as many as 5 to 6 beetles, all of which belong to the same comparatively rare species, in one day ; accidental swallowing of the beetles in mud or dirt is therefore unlikely. The suggestion that the eggs are swallowed in food, such as decomposed fish, is also improbable in view of the fact that small children whose diet consisted of milk and barley-water have been affected, while it is unlikely that the larvae and pupae could survive in the human intestine. The method of invasion, per anum, during sleep, previously discussed [*R.A.E.*, B, x, 81 ; xii, 135], is thought the most probable.

ROY (D. N.). **A Note on the Breeding and Habits of the Eye-fly, *Siphonella funicola*, Meij.**—*Ind. Med. Gaz.*, lxiii, no. 7, pp. 369–370, 1 chart, 2 refs. Calcutta, July 1928.

An attempt has been made in Assam to find the natural breeding-places of *Siphunculina* (*Siphonella*) *funicola*, de Meij. (eye-fly), which is a serious pest from May to July, and is also thought to be directly responsible for the spreading of Naga sore and conjunctivitis ; a chart is given showing the seasonal incidence of these diseases, which coincide closely with the prevalence of the flies. Attempts made to rear the insects in the laboratory failed, as the flies did not survive in any circumstances for longer than 6 days. In order to trap emerging flies in the field so as to determine the breeding-places, small square mosquito nets, the insides of which were lined with longcloth, were spread over human faeces, cow or horse dung, decaying leaves or fruit, bark from the trunks of trees together with mounds of termites, etc. The nets were left for 2-3 days, but flies were actually only bred from dung, urine and sodden earth in cattle sheds.

The flies are very active on hot days and cannot be found when the air is cool or the sky cloudy. They rest on thatch, strings, and small strips of cane hanging from roofs ; within 2-3 days portions of the straw on which they have rested turn black and are covered over with a web containing the flies. *S. funicola* feeds on warm human excretions, on the exudates of ulcers of man and animals, putrid sloughs of ulcers, etc., and is found in larger numbers in cowsheds than in other parts of houses, there being also very few in open fields. It usually settles on the healthy skin surface at the margin of ulcers, feeding by trying to force the proboscis through a rent in the scab and thus get at the exudation below, and not, apparently, as suggested by Senior-White [*R.A.E.*, B, xi, 50].

BRUMPT (E.). **Précis de parasitologie.**—4th edn., Cr. 8vo, viii+1452 pp., 5 pls., 795 figs. Paris, Masson & Cie, 1927. Price *Frs.* 90 paper ; *Frs.* 100 cloth.

In spite of the fact that only five years have elapsed since the publication of the third edition of this book [*R.A.E.*, B, xi, 7], the large amount of important work that has been published on parasitology in that time has made it necessary to enlarge it by more than 200 pages.

The chapters dealing with Arthropods have been extensively revised, particularly as regards classification and nomenclature, and additional

information has been given on the bionomics of blood-sucking Nematocera and on the control of *Glossina*. Additions have also been made in the chapters dealing with pathogenic organisms of which Arthropods are the vectors.

PHILIP (C. B.). **Methods of collecting and rearing the immature Stages of Tabanidae (Diptera).**—*J. Parasit.*, xiv, no. 4, pp. 243–253, 2 figs., 13 refs. Urbana, Ill., June 1928.

The methods adopted by the author for collecting and rearing Tabanid larvae in Minnesota are described, and those employed by previous workers are briefly discussed. For rearing and studying larvae in the last three or four instars, it was found most satisfactory to place each larva in a small vial about $2\frac{1}{2}$ ins. high by $\frac{5}{8}$ – $\frac{3}{4}$ in. in diameter, covered with a square of cheese-cloth held in place by a rubber band, and containing a short strip of paper towelling rolled up, with the inner end looped in the reverse direction to form a transverse partition, and just enough water in the bottom to keep the paper wet. It was found that fewer larvae attempted to escape through the covers of the vials when they were kept in the dark. After pupation, and some time before the emergence of the fly, the paper towelling should be pushed down around the pupa so that its anterior end projects with sufficient room in the top of the vial for the adult to emerge and hang from the cheese-cloth to stretch its wings. Newly-hatched larvae of *Tabanus* were found to be most conveniently reared and studied in small glass dishes with tightly fitting covers. For the first and second instars dishes 40 mm. in diameter by 20 mm. deep were used, after which the larvae were transferred to dishes 60 mm. in diameter by 30 mm. deep until they were large enough to be placed in the vials. A piece of water soaked dead leaf or of paper towelling was placed in each dish, together with just enough water to cover the larva. Freshly killed fly maggots are the most suitable food for the larvae; for newly-hatched larvae it is often advantageous to kill the maggots by cutting them in two. In no case was development of newly-hatched larvae of *Chrysops* obtained beyond the second instar.

SIMMONDS (H. W.). **The House Fly Problem in Fiji.**—*Agric. J. Dept. Agric. Fiji*, i, no. 1, pp. 12–23. Suva, 1928.

Investigations have proved that the principal breeding-place of house-flies in Fiji is cow droppings in the open field. These flies cannot therefore be *Musca domestica*, L., with which they were previously confused, as it does not normally breed in this medium. Large numbers of the larvae were found in cow droppings in various localities; pupae were less common, but were also present in drying cakes of dung or in the soil beneath and amongst the surrounding grass roots. The city dump was found to be an additional source of the fly in Suva, the larvae occurring in an area of 3–4 ins. in depth, below which fermentation took place and rendered the temperature too high for their survival. It is therefore suggested that the material be spread in a thick layer in order to reduce the surface area and increase the rapidity of fermentation. Very few larvae were found in stable bins, probably because wood chips are used for bedding instead of straw or sawdust. Muscid larvae were seldom obtained from horse droppings, but the ant, *Pheidole megacephala*, swarms over these and is frequently seen removing

eggs and larvae, 50 per cent. being destroyed by this predator in one locality. This ant does not, however, swarm on cow-dung, which is of a different texture, the eggs of the flies being laid in it instead of on the surface. The fly feeds both on excrement and foodstuffs, and as it also settles on wounds and the lips of small children, it is probably a serious vector of disease. It was found to be present in latrines and bred in human faeces.

Stomoxys calcitrans, L., appears to have become commoner than formerly, a large proportion of the pupae collected from stables having been found to be this species, which was also the only one found in rotting grass cuttings. No parasites were bred from pupae collected from cow-dung, but *Spalangia* sp.(?) was bred from some in horse manure the majority of which were those of *Stomoxys*, though the house-fly was also attacked. It is suggested that the control of flies breeding in cow-dung might be accomplished in closely settled areas such as Suva, by the prohibition of cattle or alternatively by spreading the dung at least twice a week in order to destroy the larvae while they are still young. These methods would be impossible in large districts, and the introduction of direct predators, such as Staphylinids and Carabids or of dung-burying beetles [Coprids], which are employed in Hawaii against *Lyperosia irritans*, L., with promising results, is suggested. The Fijian house-fly requires twice as long for its development as *L. irritans*, and beetles should therefore be even more successful against it. The introduction of the Australian wagtail [*Rhipidura tricolor*] [R.A.E., B, xv, 44] is also suggested.

Oviposition normally occurs on droppings from 4 to 24 hours old and is as common in bright sunshine as in dull weather, but does not take place in the rain. A number of batches of eggs laid between 10 and 11 a.m. collected from droppings estimated to be about 12 hours old hatched in about 9 hours, with a temperature of between 74° F. and 86° F. The larval stage lasted about 7 or 8 days in normal summer weather, and the pupal stage averaged 6 days. The pre-oviposition period probably lasts from 3 to 7 days, making the length of the life cycle from egg to egg 14-21 days in summer; the period is thought to be prolonged in the winter.

GRADY (A. G.). **Studies in breeding Insects throughout the Year for Insecticide Tests.**—*J. Econ. Ent.*, xxi, no. 4, pp. 598-612, 4 refs. Geneva, N.Y., August 1928.

This series of studies in the breeding of insects for testing insecticides includes a paper describing a procedure by means of which large cultures of *Musca domestica*, L., of high vitality can be developed as easily in winter as in summer. The larvae were reared on a medium consisting of fresh horse manure kept moist with water and yeast cells suspended in water, while the adults developed sufficiently well on milk, bread, sugar and yeast. The equipment, which is described in detail, consisted of a simple insectary containing oviposition cages, rearing jars, and stock cages in which the flies were kept. A constant temperature of 86° F. was maintained, and a trough of wetted sawdust, placed under the steam coil, was used to keep the relative humidity at 40 per cent. About 200 adult flies were kept in each of six oviposition cages in which fresh manure was placed every second day, the eggs being removed at the same time. About 500-600 eggs and larvae obtained in this manner were transferred to each of four rearing jars,

three-fourths full of loosely packed horse manure to which 200 cc. of water was added to keep it moist until the adults emerged. At a temperature of 86° F. development from egg to adult occupied approximately 11 days. Adults should be removed to the stock cages soon after emergence to avoid overcrowding. The adult house-fly bred under artificial conditions during the winter months was most active and resistant when 4-5 days old and proved to be more resistant to toxic compounds than wild flies or controlled cultures developed during the summer.

Although reaching the peak of activity and resistance on the fifth day, adults remained active and resistant until the eighth day after emergence. Longevity of the adult varied from 2 to 33 days with an average of 13. The comparatively short life-cycle and rapid development observed during these studies, as compared with previous records, which give the average longevity during warmer seasons as 20 days and development as longer by several days, may be due to constant high temperature, special diet and absence of direct sunlight.

PEET (C. H.) & GRADY (A. G.). **Studies in Insecticidal Activity.**—*J. Econ. Ent.*, xxi, no. 4, pp. 612-623, 7 refs. Geneva, N.Y., August 1928.

This series of studies, in which an attempt was made to establish the testing of insecticides on a comparable basis, includes a paper dealing with tests of insecticides employed against flies. The necessity for the reduction of all variable elements to a minimum is pointed out, and it is suggested that a definite standard be adopted for time, temperature, humidity, insecticide concentration, carrier, fineness of spray, air conditions, angle of spray and condition of insect, thus leaving only the biological element subject to variability. In the method described, numerous flies, never less than 100 but not more than 1 to a cubic foot, were liberated in a chamber, the construction of which is described in detail, kept at a constant temperature of 85° F., into which the insecticide was introduced through $\frac{1}{8}$ in. holes by means of an atomiser, modified to provide for the accurate determination of the amount and pressure of spray used. The amount of solution used in each test was 12 cc. sprayed in about equal quantities through each hole, the door and all openings being kept tightly closed for 10 minutes. At the end of this period, all flies still clinging to the walls and ceiling were counted, and those that had dropped were transferred to clean cages for observation. Those alive at the end of 24 hours were added to those taken from the walls and ceiling, all of these being considered to have escaped the action of the insecticide.

MACDOUGALL (R. S.). **Insect and other Invertebrate Pests in 1927.**—*Trans. Highl. Agric. Soc. Scotland*, (5) xl, pp. 116-145, 16 figs. Edinburgh, 1928.

The problem of infestation of cattle by *Hypoderma* in Scotland is complicated on farms that are mainly arable by the fact that the farmers do not rear their own stock, and having no land to spare for grazing in summer, import cattle that may be infected from Ireland and elsewhere, and the dressing of these cattle does not seem worth while since fresh ones will be imported in the following autumn. On the other hand, on farms where stock is mainly reared and pastured on

the spot, the consistent destruction of the warble flies (*H. bovis*, DeG., and *H. lineatum*, Vill.) must result in a reduction of their numbers. Two dressings, one an oil used in Denmark and the other an ointment of 1 part iodoform to 5 parts of vaseline were tested, and both were found satisfactory.

BANZHAF (W.). **Wenig bekannte Parasiten unseres Wildes.** [Little known Parasites of our Game Animals.]—*Natur und Museum*, lviii, no. 6, pp. 281–284, 4 figs. Frankfort a. M., June 1928.

The Oestrids infesting game animals in Germany are *Cephenomyia stimulator*, Clark, on roe deer, *C. rufibarbis*, Mg., on red deer, and *C. ulrichi*, Brauer, on elk.

HOBMAIER (A. & M.). **Morphologie und Biologie der Larve von *Gastrophilus pecorum*.**—*Centralbl. Bakt.*, (1) Orig., cviii, no. 1–4, pp. 163–172, 1 pl. Jena, 25th July 1928.

The morphology and biology of the various larval instars of *Oestrus* (*Gastrophilus*) *pecorum*, F., infesting horses are described, this being the first of a series of studies of various species of this genus undertaken to obtain definite information on the migration of the larvae in the body of the host. The observations were made in Estonia. The first instar larva bores in the cutaneous mucous membrane of the oral cavity towards the pharynx. The second and third instars were found in the throat, the latter also occasionally in the oesophagus. This normal occurrence in the throat of the larvae of this species is opposed to statements in the literature.

LINDNER (E.). **Die Fliegen der Milchzentrale.** [Flies at the Central Milk Dépôt in Stuttgart.]—*Mitt. Ges. Vorratsschutz*, iv, no. 4, pp. 42–43. Berlin, July 1928.

An unexplained occurrence of *Leptocera caenosa*, Rond., a Borborid fly hitherto recorded from caverns, the larvae of which are supposed to develop in bat manure, is recorded from a new milk dépôt at Stuttgart. No larvae have been found in the building. In a room devoted to cheese-making *L. caenosa* did not occur, but *Drosophila buscki*, Coq., and *D. repleta*, Woll., were found.

DE SOUSA NÁPOLES (F. M.). **Subsídios para o estudo das tripanosomíases animais ao norte da Colónia de Moçambique.** [Contributions for the Study of Animal Trypanosomiasis in the North of the Colony of Mozambique.]—*Bol. agric.-pecuário*, 1928, no. 2, pp. 97–108. Lourenço Marques, 1928.

The Zalala forest region in northern Mozambique has long been infested by *Glossina*, but the flies are now very much rarer, their disappearance coinciding with the gradual replacement of the forest by palms. The species found by the author were *G. brevipalpis*, Newst., and *G. austeni*, Newst. Pupae of *G. austeni* and possibly also of *G. morsitans*, Westw., and *G. pallidipes*, Aust., were collected. The breeding-places of *G. austeni* were always in true virgin forest,

compact and damp in character. Flies were rare during August, and even more so during November and December. They were somewhat localised in the forest belt along the coast. This concentration, especially of *G. austeni*, is thought to be due to the larger number of wild pigs there owing to the neighbourhood of extensive plantations of maize and cassava. Some of the places where pupae were found are described, many being under the trunks of palms.

BEVAN (L. E. W.). **Report of the Director of Veterinary Research, Southern Rhodesia, for the Year 1927.**—Fol., 14 pp. Salisbury, Rhodesia, 1928.

Game in areas infested with tsetse-fly [*Glossina*] can become infected with various species of trypanosomes and apparently remain unharmed. A method of treating domestic animals to produce a similar condition of "tolerance" is being tested, and the results have proved very successful, though the method is not yet perfected. A routine method of treating herds that have become naturally infected has been recommended and applied with considerable success. Experiments have been continued to ascertain the influence of arsenical dips on the course of trypanosomiasis in cattle. Although it is difficult to arrive at definite conclusions, owing to the natural fluctuations of parasites in the peripheral blood, it was definitely observed that weekly dipping exerts no beneficial influence on the course of the disease, and in cold or windy weather the immersion appears to be definitely harmful to the infected animals.

JACK (R. W.). **Report of the Chief Entomologist for the Year 1927.**—*Rep. Secy. Dept. Agric. S. Rhodesia 1927*, pp. 25–29. Salisbury, 1928.

In the Lomagundi district the number of game animals that had to be destroyed in the fenced area was smaller than in the previous year [*R.A.E.*, B. xvi, 15]. No tsetse-flies [*Glossina morsitans*, Westw.] have been found south of the fenced zone, though special attention has been paid to the localities where they were found last year. They were not found on the farms formerly affected on the eastern side of the Hunyani river, and except on the northernmost farm no trypanosomiasis occurred. Within the fenced zone the fly seems to have retreated appreciably, and except close to the north of the northern fence no individuals have been encountered within about eight miles of the Hunyani River. In a sub-district where the driving back of game has been continued, losses among native cattle have diminished considerably, 29 cases of trypanosomiasis occurring in 1927 compared with 141 in 1926. Herds of cattle along the Gwaai river became infected with trypanosomiasis [*loc. cit.*], and the period of immunity, presumably brought about by the former game elimination operations, has thus been limited to five years.

In an area where a deferred and organised grass-burning was carried out, although a slight change in distribution was apparent, the average density of the fly seemed to be little affected. A comparatively small proportion of puparia appears to have been destroyed, but this was also apparent after an earlier burning. The percentage killed was

probably too small to produce any practical benefit. There was a steady decrease in the number of flies from July onwards, so that the number to be dealt with at the time of burning was somewhat unsatisfactory. An outbreak of trypanosomiasis occurred among native cattle early in the year in a locality far from any known fly area. An investigation was made, but no fly was discovered.

DUKE (H. L.), HALL (G. N.) & HADDON (E. C.). **An Examination of the Efficacy of arsenical Solutions in the Reclamation of Tsetse Areas.**—*Bull. Ent. Res.*, xix, no. 1, pp. 7-29, 11 refs. London, August 1928.

The opinion has been expressed that the recession or disappearance of tsetse-flies [*Glossina pallidipes*, Aust.] in certain parts of Zululand is due to the introduction into those areas of the practice of dipping, and that a judicious combination of dipping and the use of poisoned dummies might prove an effective means of exterminating *Glossina* on a large scale. Evidence was given to show that an area formerly infested with the fly now supports a large number of healthy cattle, but nothing was brought forward to prove that the fly had not already disappeared or greatly diminished from all or part of the area before the cattle were introduced, while there are indications that changes were taking place in the environment of the fly calculated to upset the balance essential to its survival. It is also suggested that the so-called nagana of which cattle formerly died in these areas may have been some tick-borne disease or a combination of it and trypanosomiasis.

The results of a series of experiments made in Uganda with *Glossina palpalis*, R.-D., and arsenical solutions to determine the questions raised in this connection, showed that while sufficient arsenic to kill the fly can be taken up during the examination by its proboscis of an impregnated surface, whether wet or dry, when the vehicle for the poison is the skin of a living animal, it will be able with almost perfect impunity to extract blood however heavily the skin of that animal is saturated with arsenic, the risk being, however, greater when the skin is wet. The suggestion of the employment of dummies impregnated with arsenic requires further examination in natural surroundings, but it appears unlikely that a fly able to distinguish between a dead and live animal will be imposed on by this means.

Details are given of further experiments carried out to determine the effect of dipping on cattle infected with trypanosomiasis. A 1-300 solution of Cooper's dip was employed, and although this is weaker than the minimum found efficacious by Bevan with guineapigs [*R.A.E.*, B, xv, 46], the results suggest that it would be dangerous to employ a stronger dip on a large scale for cattle. Of the six animals under observation four died, two dipped and two undipped; and two apparently recovered. While judicious dipping leads to a general improvement in the animal's condition and gives it the best possible chance of utilising its resources in the struggle with the parasite, the employment of arsenicals to keep trypanosome infections in abeyance by direct drug action would seem to encourage the development of arsenic-fast strains. Of the three trypanosomes seen during the experiments, *Trypanosoma vivax*, *T. brucei* and *T. congolense*, the two latter, which are notoriously resistant to arsenic, showed little response to the quantities made available by dipping.

LESTER (H. M. O.) & LLOYD (Ll.). **Notes on the Process of Digestion in Tsetse-flies.**—*Bull. Ent. Res.*, xix, no. 1, pp. 39-60, 10 figs., 3 diagrs., 7 refs. London, August 1928.

The following is the authors' summary of this paper: The salivary glands of *Glossina* contain a powerful anticoagulin, which delays the clotting of blood of mammals, birds, reptiles and batrachians. It was found that when the salivary glands were removed from the living fly, it can still draw blood normally and may live long, but sooner or later large clots form in the narrow anterior portions of the alimentary tract, so that the fly can no longer feed and dies of starvation. The purpose of the anticoagulin is to prevent such clotting and blood coagulation in the crop.

The proventriculus and first third of the mesenteron are themselves inert in relation to coagulation of blood, but as removed from the normal fly, they contain the anticoagulin, which is derived from the salivary secretion.

The hinder part of the mesenteron contains a powerful coagulin, the purpose of which is to neutralise the anticoagulin and cause a rapid clotting, in order to retain the fluid meal in the proper region while draining and assimilation take place, probably also to save strain on the sphincter mesenteri and prevent occasional loss of food through the anus.

Both enzymes have all the ordinary properties of ferments, the salivary enzyme being rather the more stable of the two. When mixed, they probably unite by some weak chemical action and form an inactive compound. It also appears probable that the salivary enzyme combines loosely with some element in the blood in such a way that its neutralisation by the coagulent enzyme is delayed. The salivary enzyme is believed to intervene in what is considered to be the first phase of clotting, the formation of thrombin, and to be akin to anti-kinase. As the mesenteric enzyme has no effect on blood from which the calcium has been removed, it is not akin to thrombin and probably also influences the first phase of clotting, acting like the enzyme kinase.

Very rapid draining of the meal is necessary to lighten the fly and allow the blood to pass from the crop to the midgut while the salivary secretion still prevents its clotting. The mechanism of draining is described. The Malpighian tubes only function properly when the fluid of the meal has an osmotic pressure near that of blood. A large meal of water kills the fly, generally rapidly.

POULTON (W. F.). **Glossinae Investigations.**—*Rep. Vet. Dept. Uganda* 1927, pp. 9-10. Entebbe, 1928.

Investigations have shown that *Glossina morsitans*, Westw., has definitely evacuated the large tracts of country in Ankole that it occupied in 1915-20. One new locality in which *G. pallidipes*, Aust., occurs in small numbers was found. The activity at some tinfields in the fly belt occasioned motor traffic with uninfested areas, and two houses were erected to fumigate by means of smoke, generated on a portable forge from damp grass and weeds, all vehicles leaving the infected area. A clearing one mile broad and three-quarters of a mile long was made round one house as the section with which it was dealing had, in the past, shown the greatest tendency to spread. The measures taken

appear to have been successful for the last six months, but a further year must elapse to demonstrate their efficiency. Local outbreaks of trypanosomiasis were traced to the movement of trade cattle that had been in contact with *G. pallidipes*, and pending investigations, instructions were issued for cattle to pass through the sector only at night; owners that followed this advice appear to have maintained their cattle free from infection.

HALL (G. N.). **Report of the Veterinary Pathologist.**—*Rep. Vet. Dept. Uganda 1927*, pp. 17–27. Entebbe, 1928.

An outbreak of trypanosomiasis in cattle caused by *Trypanosoma congolense* occurred on an island in Lake Victoria where the only species of *Glossina* believed to be present is *G. palpalis*, R.-D. The origin appeared obscure as the infected herd had been on the island since it was imported free from infection from the mainland in 1923, and no strange stock seemed to have been recently introduced. Buffalos are reported occasionally to swim from the mainland, their point of departure being probably situated in the area occupied by *G. palpalis* and *G. pallidipes*, Aust., and it has been suggested that these animals were infected with *T. congolense*, which was then transmitted directly to the cattle, since they appear to lie in close proximity. The resident native stock was moved two miles, and four uninfected oxen were sent to the centre previously occupied by these cattle. These oxen ultimately became infected with *T. congolense*, and two of them previously showed infection with *T. vivax* and *T. brucei*. Of the individuals of *G. palpalis* dissected, numbers harboured flagellates, some of which appeared to be *T. grayi*, but only one fly showed forms resembling *T. congolense*. Although this investigation did not prove that *G. palpalis* was the carrier of the infection, it indicates that this may be the case, since there was no connection between the infected native stock and the experimental animals, and the danger of mechanical transmission was therefore eliminated.

No infection was obtained when infected and healthy cattle were kept for three months in a fly-proof room in which not less than 300 individuals of *Stomoxys* were maintained continuously by daily additions of fresh flies. In captivity the flies become sluggish and are disinclined to feed on the experimental cattle. This alteration in habit may account for the failure to transmit trypanosomiasis mechanically under artificial conditions.

RICHARDSON (U. F.). **Notes on Trypanosomiasis of Cattle in Uganda.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xxii, no. 2, pp. 137–146. London, 22nd August 1928.

It is generally accepted that the normal transmission of trypanosomiasis of cattle in Uganda is by tsetse-flies. Exposure to *Glossina morsitans*, Westw., or to *G. pallidipes*, Aust., usually causes an outbreak of infection by *Trypanosoma congolense* while *G. palpalis*, R.-D., causes infection by *T. vivax*, but does not normally transmit *T. congolense*. As outbreaks of *T. congolense* are commonly encountered far from fly belts, it is assumed that it is transmitted mechanically by biting flies other than *Glossina*. Observations showed that this mechanical transmission produced the disease almost as rapidly as syringe inoculation, but that animals under two years old seldom acquire

infection in this way. Laboratory experiments with wild *Stomoxys*, both caged and in loose fly-proof stalls, proved negative for both trypanosomes, but as *Stomoxys* is frequently the only biting fly present in large numbers when infection occurs, it seems nevertheless that it must be the transmitting agent. Since both types of infection seem to spread regularly in dipped cattle, it is not likely that such parasites as ticks, which do not leave the host and are killed by the dipping fluid, are carriers.

FLETCHER (W.), LESSLAR (J. E.) & LEWTHWAITE (R.). **The Aetiology of the Tsutsugamushi Disease and tropical Typhus in the Federated Malay States.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xxii, no. 2, pp. 161–173, 7 figs., 9 refs. London, 22nd August 1928.

In this study of tsutsugamushi disease, with notes on its occurrence in Sumatra and the Malay States, it is recorded that small rodents (particularly rats) are the reservoirs of the virus which is carried from them to man by mites in the larval stage. In experiments by other workers the disease has been conveyed to monkeys by inoculation and also by the bites of infected mites. A description is given of four species of mite commonly found in the ears of rats in the Malay States; these are *Trombicula pseudoakamushi*, Hatori, *T. indica*, Hrst. (*T. muris*, Walch), *T. oudemansi*, Walch, and *T. deliensis*, Walch. The last-named is the carrier in Sumatra, and an examination of 130 black rats indicates that it is also the carrier in the Malay States. In Japan and Formosa *T. akamushi*, Brumpt, is the carrier.

ADLER (S.). **A Note on the Transmission of *Leishmania tropica* directly from Sandfly (*Phlebotomus papatasi*) to Sandfly.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xxii, no. 2, pp. 177–178, 1 ref. London, 22nd August 1928.

The method of infecting *Phlebotomus papatasi*, Scop., with cultures of *Leishmania tropica* has been described [R.A.E., B, xv, 221]. This paper explains a method of artificially infecting one sandfly from another.

BUXTON (P. A.). **An Aspirator for Catching Midges.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xxii, no. 2, pp. 179–180, 1 fig. London, 22nd August 1928.

The aspirator described consists of a glass tube 4 ins. by 1 in. in diameter, corked at each end with an inlet and outlet tube passing one through each cork. The inlet tube is narrowed at the external end to increase the draught. The outlet tube is fitted with a piece of rubber tubing some 15 ins. long ending in a mouthpiece, and the extremity within the 4 in. tube is slightly expanded and covered with fine gauze to prevent the inhalation of the midges captured.

KLIGLER (I. J.) & ASHNER (M.). **The Leptospiricidal Power of Extracts of *Aedes aegypti* (*Stegomyia fasciata*).**—*Trans. R. Soc. Trop. Med. & Hyg.*, xxii, no. 2, pp. 181–184, 1 pl., 8 refs. London, 22nd August 1928.

Experiments are described in which the gut of the mosquito, *Aedes argenteus*, Poir. (*aegypti*, L.) was teased out, extracted in saline, and the

extracts mixed with cultures of *Leptospira icteroides*. The effect, with undiluted material, is prompt and striking, and with diluted material is similar but takes longer. The organisms become rigid, as though suddenly paralysed, and after a few hours disintegrate and disappear. On subsequent inoculation of these cultures into a favourable medium no growth appears.

CONNAL (A.). **Annual Report of the Medical Research Institute, 1927.**

—*Ann. Med. & Sanit. Rep. Nigeria 1927*, Appx. A, pp. 5-46, 9 pls., 2 charts. Lagos, 1928.

The seasonal occurrence of the following ecto-parasites found on rats at Lagos is given: *Xenopsylla cheopis*, Roths., *X. brasiliensis*, Baker, *Ctenocephalus canis*, Curtis, *Laelaps echidninus*, Berl., and *Haematopinus* sp. The seasonal occurrence of mosquito larvae collected between January and September, together with details of their breeding-places for each month, is given by S. L. M. S. Connal.

JOHNSON (W. B.) & LLOYD (LI.). **Report of the Tsetse Investigations,**

1927.—*Ann. Med. & Sanit. Rep. Nigeria 1927*, Appx. B, pp. 49-58, 3 pls., 1 chart, 2 figs. Lagos, 1928.

The eradication of the forest and thickets in the primary and main secondary foci of the tsetse-flies has been continued, leaving the general forest untouched. This method is successful with *Glossina tachinoides*, Westw., which is dependent on these foci for practically the whole year, but *G. morsitans*, Westw., depends on them only in the later months of the dry season, and its success with this species is not yet assured [*R.A.E.*, B, xv, 36]. The clearing of the primary foci has not yet been sufficiently extended to curtail the wet season spread of the fly. In one primary focus, where the fringing forest was cut in March 1926, the numbers of fly fell below normal for the rest of the dry season, but the spread in the wet season brought the numbers back to normal in September and October. At this time the nutrition of the fly was about equal to that in an untouched focus in the vicinity, since the growth of prone creepers over cleared ground left the game visible. In the following dry season the new growth was slashed back and burning was done, and, considering the proximity of the untouched focus, the number of *G. morsitans* present up to July was insignificant, but the spread in the wet season again brought the numbers up to normal. The long coarse grass had, however, overgrown the clearing, and as the game was inconspicuous, only 46 per cent. of the flies were well nourished, as opposed to 80 per cent. in the untouched focus. The extraordinary density of *G. morsitans* in the untouched focus during the rains of 1927 when compared with previous years shows that though the wet season spread is still occurring, the flies have been confined to a considerable extent to this bush, which is now being cut down.

When the cutting is done early in the dry season before the grass is burnt, effective firing that will destroy most of the slash may be carried out before the rains. When the cutting is done later in the dry season, it is advisable to leave the slash until the grass is thoroughly dry in the next dry season when a fierce uniform fire is possible. In most cases it is necessary to slash back new growth and re-fire as much

as possible round stumps in the second dry season after the fire has passed. It appears that stacking the slash round the stumps when the bush is first cut is uneconomical owing to the amount of labour required.

Studies on enzymes in tsetse-flies influencing the coagulation of the blood and on the use of the precipitin test to determine their food supply have already been noticed [*R.A.E.*, B, xvi, 23, 55, 259].

FIELDING (J. W.). Observations on Eye Worm of Birds.—*Queensland Agric. J.*, xxx, no. 1, pp. 37–41, 1 map. Brisbane, 1st July 1928.

A list is given of 250 wild and 109 domestic birds, including 64 species, examined for ecto- and endo-parasites, and especially for worms in the eyes, which were found in 7 species. The information on the association of *Oxyuris spirura parvorum* and the cockroach, *Pycnoscelus (Leucophaea) surinamensis*, L., has already been noticed [*R.A.E.*, B, xv, 77; xvi, 102, 195].

ILLINGWORTH (J. F.). Lice affecting Poultry in Hawaii.—*Proc. Hawaii. Ent. Soc.*, vii, no. 1, pp. 41–42. Honolulu, June 1928.

The following lice were taken from poultry in the vicinity of Honolulu during 1926: *Menopon gallinae*, L., from turkey, guinea-fowl and fowls; *M. phaeostomum*, Nitz., from guinea-fowl and pea-fowl; *Eomenacanthus (Menopon) stramineus*, Nitz., *Goniodes meleagridis*, L. (*stylifer*, Nitz.) (large turkey louse) and *Goniocotes gigas*, Tasch., from fowls; *G. gallinae*, Retz. (*hologaster*, Nitz.), from fowls and turkeys; *Lipeurus gallipavonis*, Geoffroy, from turkeys; and *L. heterographus*, Nitz., and *L. caponis*, L., from fowls.

Insects and Parasites affecting Livestock.—*40th Ann. Rep. Texas Agric. Expt. Sta.* 1927, pp. 30–31. College Station, Tex., 1928.

Experiments are being carried out with various chemicals and dipping preparations against three species of goat louse, *Trichodectes caprae*, Gurlt (*climax*, Nitz.), *Linognathus stenopsis*, Burm., and *T. limbatus*, Gerv. (*hermsi*, Kellogg and Nakayama), and the sheep scab mite [*Psoroptes ovis*, Hering], but only work against the last-named is discussed. To ascertain how long the mite will remain alive off the host, uninfested sheep were introduced into pens immediately or at intervals after the removal of infested ones; these were observed lying on fleeces from infested sheep, but scab did not develop during the period 20th May 1926 to 3rd January 1927. Adult mites kept in small boxes under various conditions did not survive more than 16 days and died in a very short period when exposed to the rays of the sun. Dips of nicotine sulphate were used at a strength of 0.065 per cent.; the temperature of the bath was 102.2° F., and the sheep were held in it for 3 minutes. They were dipped twice at intervals of 7, 9, 11, 13, 15 and 17 days, all cases of scab disappearing with two dippings.

HALL (M. C.). A Calendar of Livestock Parasites.—*Misc. Pub. U.S. Dept. Agric.*, no. 25, 14 pp., 21 figs., 18 refs. Washington, D.C., June 1928.

Brief notes are given on the measures required against the Arthropod and other parasites of livestock in each month of the year.

CAMPOS R. (F.). **El género *Paederus*. Su importancia en materia médica. Especies encontradas en el Ecuador.** [The Genus *Paederus*. Its Importance in Medicine. Species found in Ecuador.]—*Rev. Col. Rocafuerte*, ix, no. 27-28, pp. 227-230. Guayaquil, 1927.

Details are given of the eight species of the Staphylinid genus *Paederus* that have been recorded as causing dermatitis. They include *P. irritans*, Chapin, from Ecuador.

VEDDER (E. B.) & FELICIANO (R. T.). **An Investigation to determine a satisfactory Standard for Beriberi-preventing Rices.**—*Philipp. J. Sci.*, xxxv, no. 4, pp. 351-389, 2 pls., 8 figs., 7 refs. Manila, April 1928.

It is generally accepted that beriberi is a deficiency disease, produced when highly milled rice is the staple diet, and that it can be prevented by the substitution of a sufficiently under milled rice. The investigations described indicate that insect-infested rice when stored for a long period loses its vitamin and, owing to the depredations of the insects that eat the external layers of the grain, becomes converted into a highly milled rice that produces polyneuritis. For this reason, rice should not be stored for more than a few weeks and never for more than three months. The insects responsible for producing this condition in rice are *Calandra* (*Sitophilus*) *oryzae*, L., *C. (S.) granaria*, L., *Corçyra cephalonica*, St., and *Tribolium castaneum*, Hbst. (*ferrugineum*, F.).

[BARUIKIN (V.), ZAKHAROV (A.), KOMPANEETZ (A.) & BARUIKINA (O.). Барыкин (В.), Захаров (А.), Компанец (А.) и Барыкина (О.). **Observations on Typhus Fever. II. Typhus Fever in Clothes Lice.** [In Russian.]—*Zh. eksperim. Biol. Med.*, viii, no. 19, pp. 2-16, 5 charts, 6 refs. Moscow, 1927. (With a Summary in French.)

This is a detailed account of experiments with clothes lice [*Pediculus humanus*, L.] as vectors of typhus. The first infected individuals were taken on patients on the 5th day of the disease, the largest number becoming infected during the second week, between the 8th and 11th days. Infected lice may be found on patients as much as a week after the temperature has fallen. Experiments with guineapigs indicate that the lice are able to transmit the disease by biting, though this cannot be definitely stated. Infection is very rarely transmitted from diseased to healthy lice, even when they are kept in close contact with each other. Under experimental conditions only 2 per cent. were thus infected, so that this means of transmission is of very little epidemiological importance. The lice used in these experiments were infected by allowing them to feed on infected patients or by giving them rectal injections (Weigl method) of an emulsion made from the brain of diseased guineapigs. The progress of the infection in the louse is discussed; it frequently causes a rupture of the epithelium of the gut wall followed by the death of the insect about a week after the onset of the disease.

Healthy lice could easily be infected by the Weigl method with an emulsion made from the gut of infected lice. When they were infected by this method, the incubation period was slightly lessened, but the virulence of the infection both to the lice and guineapigs was not altered. The louse is not a mechanical carrier but a true intermediate host, as the virus of typhus develops actively within it.

[ROSENHOL'TZ (G. P.) & OVSYANNIKOVA (O. V.).] Розенгольц (Г. П.) и Овсянникова (О. В.). On the Question of the Rôle of Bugs (*Cimex lectularius*) and Ticks (*Ornithodoros moubata*) in the Transmission of Anthrax. [In Russian. — *Zh. eksperim. Biol. Med.*, x, no. 25, pp. 180–185, 5 refs. Moscow, 1928. (With a Summary in German.)]

The bed-bugs, *Cimex lectularius*, L., and imported specimens of the tick, *Ornithodoros moubata*, Murr., used in these laboratory experiments were fed on guineapigs infected with anthrax and then allowed to feed on healthy animals, but in no case was *Bacillus anthracis* transmitted by their bite. Several examples of both species were found to contain the bacillus, which had penetrated into the body-cavity, the haemolymph appearing to be a very suitable medium for its development. The bugs and ticks that were not dissected died as a result of the infection after a few days, the bacillus persisting in them for more than five months, after which period it was still infective to laboratory animals. This fact is important from the epizootic point of view, as it suggests the possibility of the formation of new centres of infection wherever the dead bodies of infected ecto-parasites occur.

PARROT (L.). Un ornithodore nouveau du Sahara algérien, *Ornithodoros foleyi*, n. sp. — *Bull. Soc. Path. exot.*, xxi, no. 7, pp. 520–524, 5 figs. Paris, 1928.

Ornithodoros foleyi, sp. n., is described from the Algerian Sahara, where it is said to attack both man and camels. The characters distinguishing it from similar species are discussed.

SCHIMOURLO (S.). Au sujet de la dengue au Soudan. — *Bull. Soc. Path. exot.*, xxi, no. 7, pp. 577–583, 15 refs. Paris, 1928.

The author's experience indicates that in the French Sudan, as elsewhere in French West Africa, dengue is a widespread endemic disease, which appears each year in epidemic form according to the number of susceptible persons and the degree of their immunity.

MATHIS (C.). Identité du spirochète de la fièvre des tiques (*Sp. duttoni*) et des diverses souches de spirochètes récurrents dakarois. — *Bull. Soc. Path. exot.*, xxi, no. 7, pp. 585–593, 3 refs. Paris, 1928.

The author has previously shown that *Spirochaeta crocidurac* infesting the shrew *Crocidura stampli*, is identical with that in man and rats at Dakar [*R.A.E.*, B, xvi, 239], and the conclusion has recently

been reached that it is closely allied to, or identical with, *S. duttoni* [xvi, 18]. Cross immunity experiments described in this paper lead to the conclusion that these spirochaetes are identical. *Ornithodoros moubata*, Murr., has not, however, been recorded from Senegal, and the transmitting agent is unknown. It is thought that the fauna commonly associated with shrews and rats can be eliminated, the true vector probably being an invertebrate that leaves the host after feeding on its blood; this might be found in the soil of the burrows of the small mammals that are the natural reservoirs of the virus.

[PAVLOVSKIĬ (E. N.).] Павловский (Е. Н.). **Study of the Ticks *Ornithodoros* in Central Asia.** [In Russian.]—*Meditz. Muisl' Uzbekistana*, no. 9-10, reprint 9 pp., 3 figs., 11 refs. Tashkent, 1928.

The literature concerning species of *Ornithodoros* as vectors of relapsing fever in Central Asia is reviewed, and a detailed description of *O. tholozani*, Lab. & Mégn., and *O. papillipes*, Bir., is given.

[PAVLOVSKIĬ (E. N.).] Павловский (Е. Н.). **Instructions for collecting Zoological Material. XVI. Instructions for collecting and studying Ticks (Ixodoidea).** [In Russian.]—8vo, 104 pp., 3 pls., 31 figs., 6 pp. refs. Leningrad, Zool. Mus. Acad. Sci. U.S.S.R., 1928. Price 1 r. 20 k.

This paper deals with the collecting, rearing, preservation and dissection of ticks and includes keys to the genera and species in the U.S.S.R., those to the Ixodids being by N. O. Olenov. Brief mention is made of the rôle of ticks as vectors of disease in various parts of the world.

[OLENEV (N. O.).] Оленев (Н. О.). **On the Ticks *Dermacentor reticulatus*, F., and *Dermacentor niveus*, Neum. (Ixodidae), and the Transmission by them of Piroplasmosis in Horses.** [In Russian.]—*Prakt. Veter.*, no. 5, pp. 35-39; no. 6, pp. 34-37, 3 figs., 24 refs. Moscow, 1928.

The morphological characters, systematic position and geographical distribution of *Dermacentor reticulatus*, F., and *Dermacentor niveus*, Neum., are discussed. Laboratory experiments were made with ticks in the autumn of 1925 in the Saratov Government and in the north of Turkestan. The method of feeding them on the scrotum of a ram is described. The females of *D. niveus* lay about 5,000 eggs; these hatch in about 86 days at a temperature of 12-16° C. [53.6-60.8° F.] and in 18 days at 20-22° C. [68-71.6° F.]. Both laboratory and field observations have shown that *D. niveus* can exist in dry as well as in damp places; the eggs hatch even under water. The larvae feed for 3-5 days and transform into nymphs 18-20 days later at a temperature of 20° C., the minimum period for the entire larval stage being 28-30 days. In the Saratov Government both adults and larvae occurred on grassland among oak forests. In Asiatic Russia *D. niveus* occurs as

far as the Pacific Ocean and in the north up to Lat. 57° N. *D. reticulatus* is found in European Russia and in western Siberia, occurring as far north as Lat. 58° N. These observations indicate that in some parts of Russia, particularly in the Saratov Government and the Russian Far East, *D. niveus* is the vector of piroplasmosis in horses. It is possible that both species may act as vectors in other localities.

SERGEANT (Ed.), DONATIEN (A.), PARROT (L.) & LESTOQUARD (F.).
Transmission de la piroplasmose bovine à *Theileria dispar* de l'Afrique du Nord par la tique *Hyalomma mauritanicum*.—*C.R. Acad. Sci. Fr.*, clxxxvii, no. 4, pp. 259–260. Paris, 1928.

The authors, working in Algeria, were unable to obtain transmission of the form of bovine piroplasmosis in north Africa due to *Theileria dispar* by the agency of the ticks, *Rhipicephalus bursa*, C. & F., and *R. sanguineus*, Latr. They found, however, that it could be transmitted by *Hyalomma mauritanicum*, Senevet, which is widely distributed, and which has not hitherto been regarded as capable of transmitting piroplasmosis.

CLARKE (J. T.). **Insect Bites and Rheumatism.**—*Brit. Med. J.*, no. 3532, pp. 511–512, 9 refs. London, 15th September 1928.

In support of his theory that the rat flea, *Ceratophyllus fasciatus*, Bosc, and not *Pulex irritans*, L., may possibly be the carrier of rheumatic fever [cf. *R.A.E.*, B, viii, 75; ix, 38; x, 119], the author points out that although the geographical distribution of *P. irritans* appears to be nearly similar to that of the disease, it would seem to be ruled out as a carrier by certain facts, one of which is that it is so common that it would be more likely to be the cause of an epidemic disease, such as scarlet fever, than of an endemic one. It has not quite the same geographical distribution as *C. fasciatus* and seems to tolerate slightly higher temperatures, though not quite such low ones as those that can be withstood by the latter. If the possibility is accepted that *C. fasciatus* may be the carrier, it is important that the relation between rats and the disease should be investigated. There is said to be a relation between throat infections and rheumatic fever, but the throat condition may be either a symptom, or a frequent concomitant of the disease; and the same insanitary conditions in houses may favour both the cause of tonsillitis and the flea-bearing rats.

WU LIEN TEH. **The Perpetuation of Plague among Wild Rodents.**—*Amer. J. Hyg.*, viii, no. 5, pp. 649–670, 21 refs. Baltimore, Md., September 1928.

The question of the means by which plague is maintained from season to season in various parts of the world is discussed with reference to wild rodents and domestic rats. Previous work by other authors on this subject is briefly reviewed. The greater part of the paper is concerned with the details of experiments that were carried out in Manchuria to determine the fate of the plague virus in *Marmota (Arctomys) bobac* (tarabagan) during the long winter.

Of the animals infected during hibernation, 6 died after 5-19 days with signs of manifest plague with bacteraemia; 2 after 28 and 48 days respectively with signs suggesting residual plague; and 2 after 88 and 130 days, awakening at the normal end of hibernation with signs of local and bacteraemic plague. There is no doubt that the fleas of these animals play an important part in spreading the disease in winter as well as in summer, and are able to preserve the virus, especially during the cold season, for lengthy periods [*cf. R.A.E.*, B, xv, 31].

The occurrence of plague with bacteraemia is essential for the propagation of the disease in rodents, their fleas being the principal vectors; cases of chronic plague do not play an important part in this, as the fleas cannot be infected from them. The fleas of the domestic rat are able to remain alive and infective, under favourable conditions, for a considerable time. The hibernation period of wild rodents with natural plague forms an indispensable link in the preservation of the virus.

PAPERS NOTICED BY TITLE ONLY.

RUGE (H.). **Kurze Beschreibung des *Ornithodoros venezuelensis* (Brumpt 1921).** [A Brief Description of *O. venezuelensis*.]—*Arch. Schiffs- u. Tropenhyg.*, xxxii, no. 8, pp. 406-409, 8 figs. Leipzig, August 1928.

APFELBECK (V.). **Contribution to the Knowledge of the Ixodid Fauna of Bosnia, Herzegovina and adjoining Regions.** [*In Serbian*.]—*Glasnik Cent. Hig. Zavoda*, ii (iii), pt. 4-6, pp. 176-195, 15 figs., 2 refs. Belgrade, 1927.

SMIT (B.). **Sheep Blow-fly Control. Fly-traps: Their Construction and Operation.**—*Bull. Dept. Agric. S. Afr.*, no. 38, 14 pp., 4 figs., 5 refs. Pretoria, 1928. [See *R.A.E.*, B, xiv, 73.]

HALL (M. C.). **Parasites and Parasitic Diseases of Sheep.**—*Fmr's Bull., U.S. Dept. Agric.*, no. 1330, revd., 35 pp., 34 figs. Washington, D.C., February 1928. [See *R.A.E.*, B, ix, 110; xii, 67.]

State Laws concerning Mosquito Control Work in New Jersey.—*Circ. New Jersey Agric. Expt. Sta.*, no. 207, 8 pp. New Brunswick, N.J., September 1927.

Instructions for the Control of Adult Mosquitos. [A Compilation by A. NABOKOV.] [*In Russian*.]—*Russ. J. Trop. Med.*, vi, no. 5, pp. 341-345. Moscow, 1928.

TATEIWA (J.). **La formule leucocytaire du sang des chenilles normales et immunisées de *Galleria mellonella*.**—*Ann. Inst. Pasteur*, xlii, no. 7, pp. 791-804, 9 charts, 6 refs. Paris, July 1928.

SMITH (N. M.) & BARRET (H. P.). **The Cultivation of a parasitic Amoeba [*Entamoeba (Endamoeba) thomsoni*] from the Cockroach [*Periplaneta americana*, L.].**—*J. Parasit.*, xiv, no. 4, pp. 272-273, 1 pl., 4 refs. Urbana, Ill., June 1928.

TALIAFERRO (W. H.). **A Note on the Amoeba of the Cockroach cultivated by Smith and Barret.**—*J. Parasit.*, xiv, no. 4, p. 274, 1 ref. Urbana, Ill., June 1928.

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